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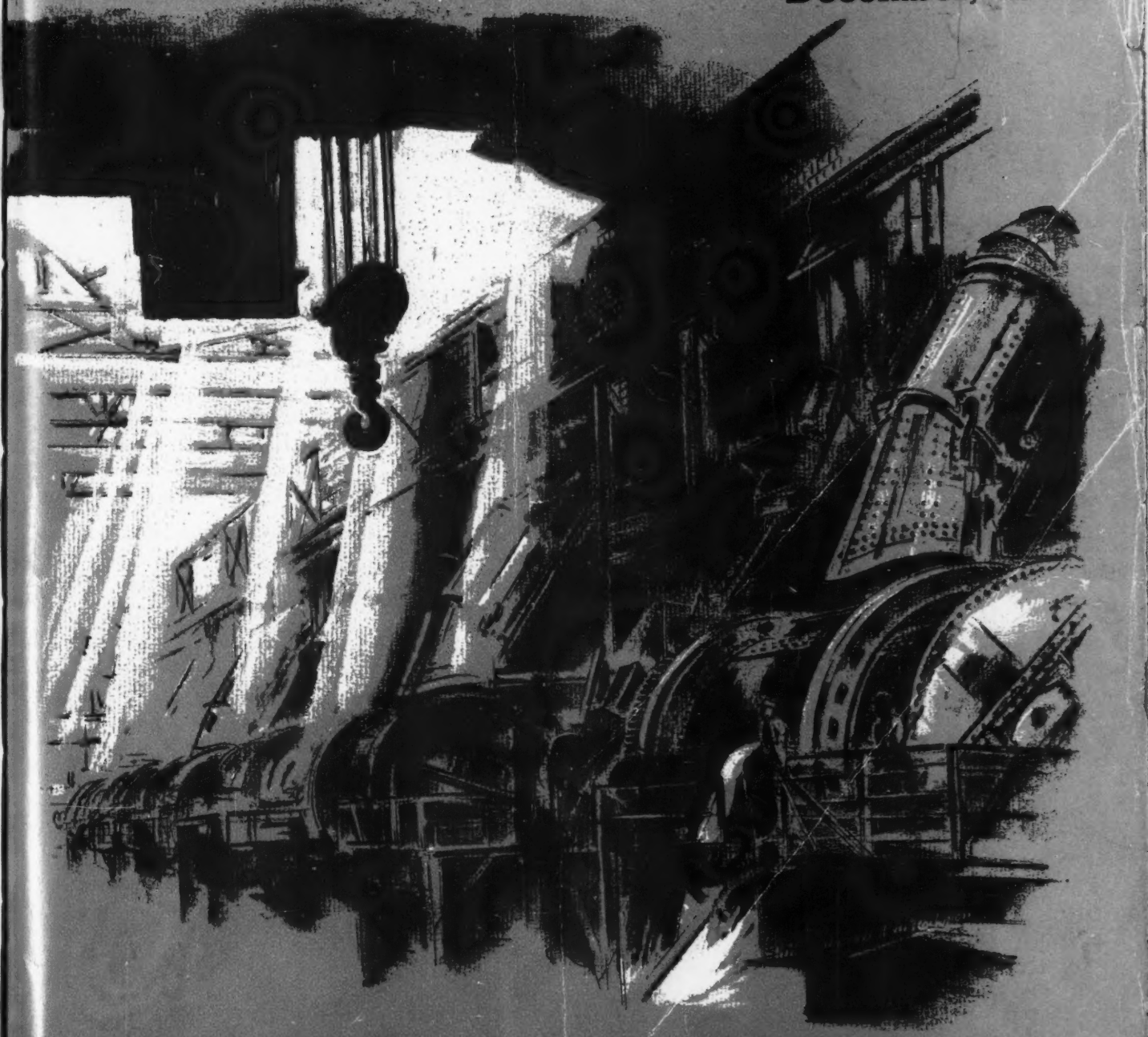
December, 1943



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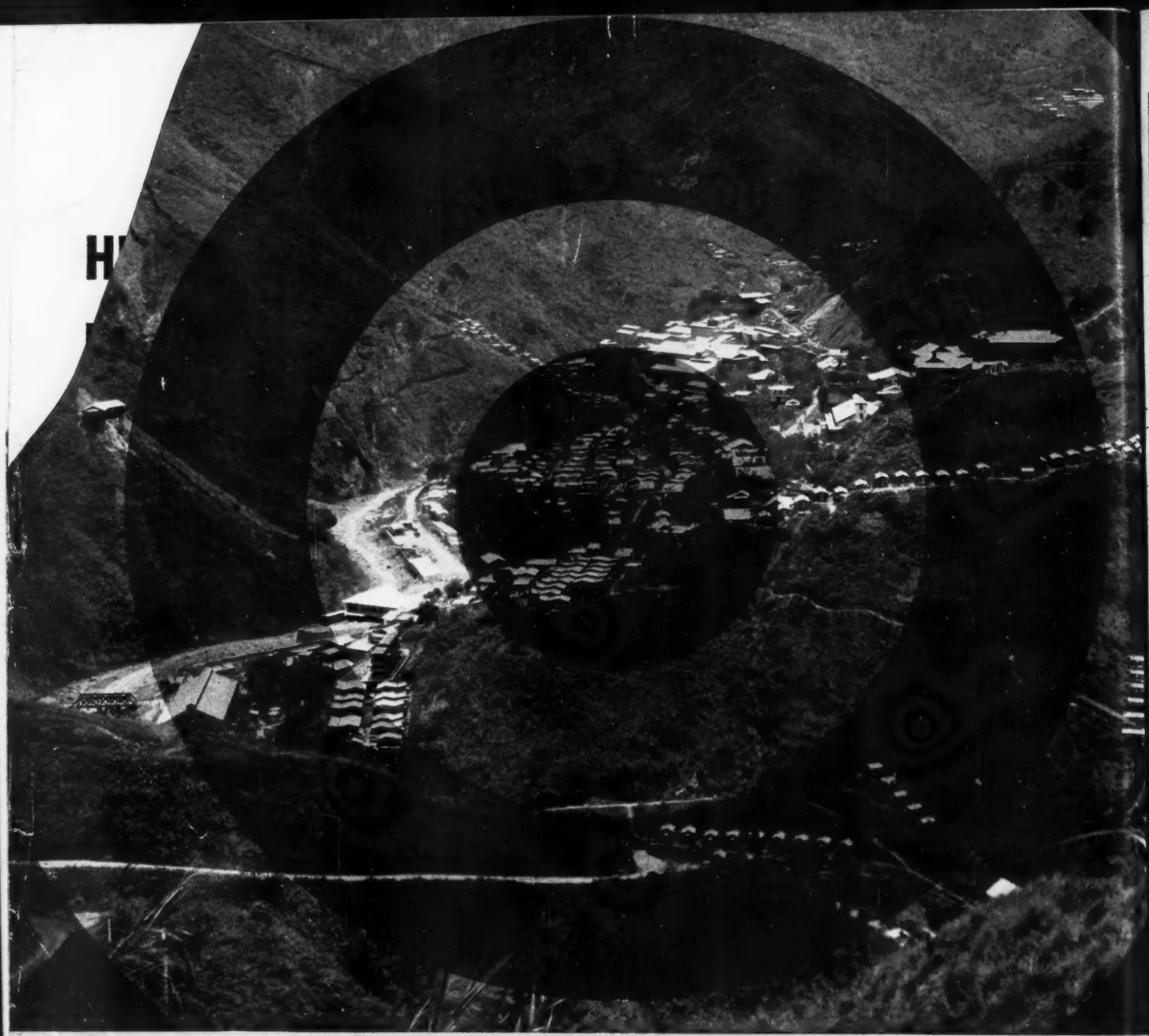

PHILIPPINE TARGET FOR

☆ *Flying Fortresses* ☆

Photograph shows a general view of a portion of the Baguio Mining District in the Philippines, with the Antamok Mine of the Benguet Consolidated Mining Co. in the foreground. Tomorrow this may be a target for Flying Fortresses, but once there were quite a number of American-built, Maximix Rubber Lined Hydroseal Pumps in this plant. Knowing the Japs' wiliness in "copy-catting" good American products, we'll bet there are now many imitation Hydroseal Pumps there. However, though the Japs may control most of the world's rubber, *they don't know our Maximix Formula,* which we developed to provide maximum life of pumping parts in the handling of abrasive material. . . . Before Bataan and Corregidor, we had representatives in the Philippines, Atkins-Kroll & Co., Manila. We hope they are still there, safely awaiting the return of MacArthur.

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Free Enterprise

THE OPPORTUNITY AND OBLIGATION TO COMPETE

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WE can be prosperous beyond our dreams—all of us—workers, farmers, and business men—but one of the prerequisites is the self-discipline of accepting competition for ourselves as well as others.

* * *

Free enterprise does not imply the freedom to use any or all means to make a profit. It does not mean the right to monopolize. ***It means the opportunity and obligation to compete.***

Competition requires ***independence of action, free access to the market,*** and ***no large degree of control over the price*** by any buyer or seller. In general, the larger the number of sellers and the more easily buyers can shift from one seller to another, the higher will be the degree of competition (and vice versa for buyers).

But let us not get too academic or go off the deep end. We cannot have perfect competition. We cannot subdivide businesses and labor unions into tiny units to make a multitude of buyers and sellers in each market; we cannot reduce our rich variety of products to a few rigidly standardized items; we cannot educate people to judge quality precisely; we cannot eliminate the costs of bridging space between buyers and sellers. On the other hand, have we gone as far as is practical and desirable in these directions?

We cannot even have a system of highly "sensitive" prices, that is, prices which fluctuate immediately in response to every minor change in demand and supply. This would occur in the dream world of competition-to-the-nth-degree. It cannot occur in the real world, or even in the ideal world of competition best suited to physical facts and human qualities. The economies of large-scale enterprise, the need for adapting products to human wants, the costs of transportation and the costs of issuing and acquiring market information put severe limits on price sensitivity.

Economists tell us that if prices were extremely sensitive, business booms and depressions would be much less severe—provided our stock of money remained fairly constant. But with the somewhat limited degree of sensitivity which is practicable in the economy, price and wage changes cannot prevent severe declines in business activity. ***We cannot count on competition alone to cure depressions.*** We must look mainly to other kinds of measures to prevent mass unemployment of men and machines.

If we cannot have prices which fluctuate with every small change in demand and supply conditions, we can work toward—and achieve, if we really want it—a system in which prices and wages are at least roughly responsive to long-run changes in demand and supply, a system in which most markets are not dominated by individual businesses, groups of businesses, labor unions, or farm organizations, and in which prices and wages are maintained at levels consistent with free access to markets and to jobs.

In any kind of an economic system there must be some means of determining prices, wages, and profits, and of bringing labor and capital into employment in the industry and place where they are most needed. There are two ways to do this: by administrative fiat or by the impersonal processes of the market. The first of these is typical of the totalitarian state; it frequently involves destruction of individual freedom or fumbling mismanagement. During the war all of us have had some experience with patronizing and paternalistic treatment by the state; we have found out what it means to be pushed around by bureaucrats; and we have discovered that the political determination of prices, wages, and profits leads to chaos when self-interest supersedes the fine fever of patriotism—as it eventually does. I do not mean to imply that we can do without controls over prices, production, and distribution in time of war; but I do suggest that we can learn something from their operation. Even with a united national purpose these controls work badly when human abilities are inadequate for the superhuman task, when personal or departmental jealousies crop up among officials, and when pressure groups try to prey on the rest of the public. Every day more Americans are beginning to understand why our forefathers feared the caprice and tyranny of power.

The impersonal processes of the market in determining prices and wages and in allocating productive resources will, in normal times, save us from the fumbling of bureaucrats and from the Babel of confusion, un-

certainty, and annoyance produced by their regulations. But these market processes will not save us from paying toll to those who monopolize and restrict entry to markets or jobs.

If we want an economy in which we are free to try out new ideas, develop new products, and introduce more efficient methods of production, if we want an economy in which there are great opportunities for men of imagination, inventiveness and energy, if we want an economy wide open to progress, then we must have a free field and fair competition for all comers—without collusion as to prices, markets, or production. This is the only basis on which we have a right to demand freedom from governmental regulation for ourselves and on which we can combat monopolistic tendencies in other quarters.

Let us stand squarely for the principles of the anti-trust laws and against all collusion and combination in restraint of trade. Let us insist that the government review with a critical eye every combination and consolidation which might restrict competition. Let us face frankly the problems of economic power arising out of price leadership and encourage every honest effort to find means to deal with them. Let us not shrink from questions as to whether some great aggregations of plants are too large for efficiency, free entry into the industry, and a free price. While we resist the efforts of the Department of Justice to extend the anti-trust laws by far-fetched and distorted interpretation, and while we fight every attempt to use them as a tool of persecution, let us cooperate in sincere efforts to modernize these laws and extend them by specific legislation to monopolistic practices they cannot now reach. I do not have a simple formula for this, but I believe we must try to find one.

We can then, better face the problem of the growing monopoly in labor which is threatening to make the free enterprise system unworkable. Today labor is going through a stage of empire building reminiscent in some ways of a similar stage in business three-quarters of a century ago. Witness the same buccaneering spirit, the same concentration on selfish interests, and the same disregard for the public welfare. Business leaders learned the hard way that the public will eventually rise up against those who prey upon them. Will our labor leaders be wiser? The right to collective bargaining to protect the weak position of the individual employee is one thing—but the grant of unlimited monopoly privilege to combine into a private government which can dictate its own terms to businesses, industries, communities, and even to the government itself, and which can start a wage-price spiral such as to hinder the war effort and make full prosperity impossible in time of peace is something quite different. We need to find a middle way which will prevent employers from exploiting employees but which does not sow the dragon's teeth. The exercise of arbitrary power by labor threatens not only business, but also all workers outside the unions and all those dependent on pensions and savings for their existence, and ultimately, of course, the well being of union workers themselves.

The idea that the labor problem can be solved if great, powerful organizations of employers will sit down with great, powerful organizations of labor is a delusion. If our experience in the N.R.A. and in the war teaches us anything, it is that the best that can be expected in the long run from such a situation is an armed truce with intermittent civil war. And every truce would be a monopolistic arrangement to take advantage of those not members of the great organized groups. Business and labor unions, whenever confronted with postwar readjustments that are unfavorable to them will be sorely tempted to protect their own special interests at the expense of the public. There will be efforts on the part of businesses, abetted by labor unions, to limit productive capacity, to raise tariffs, to obtain subsidies, and to maintain prices at artificially high levels. The unions will oppose labor saving changes and will seek higher wages even in areas and industries of surplus labor. Already demands are emerging for direct joint action by business, labor, and agriculture to solve the transition problems of special concern to them. While these groups should have every opportunity to register their own self-interest, we cannot entrust our fate to decisions made by pressure groups. If experience is any guide, such coalitions will be almost certain to restrict opportunities for progress and expansion, to exploit the public, and ultimately to injure even the businesses, workers, and farmers included in them. We cannot afford a postwar N.R.A. Resort to temporary government regulation in the transition from war to peace may, however, be necessary in cases of great hardship.

We can be prosperous beyond our dreams—all of us—workers, farmers, and business men—but one of the prerequisites is the self-discipline of accepting competition for ourselves as well as others.

President, McGraw-Hill Publishing Company, Inc.

ENGINEERING AND MINING JOURNAL

H. C. Parmelee, Editor

Mining After the War

THE MINING INDUSTRY, which has been buried to the eyebrows in the gigantic task of providing minerals for war, is now awakening to the fact that many of its branches are already experiencing a foretaste of postwar problems. Having achieved a volume of production that has not only caught up with, but is now in excess of, actual war requirements, the industry faces conditions inevitably resulting from its all-out effort—huge and rapidly growing stockpiles, and consequent reductions in prices and premiums paid to producers. Beyond the job of shrinking the industry back to a rate of production in keeping with its markets, what are some of its postwar problems?

Probably the one uppermost in the minds of most producers is that of disposing of the metal inventories which have been accumulated for war purposes, and the scrap which will result from the salvage of military equipment. Obviously, if all of this material is dumped into the domestic market for what it will bring, the primary producers will be temporarily ruined.

Aside from the costs due to crushing taxation and higher wages, domestic mine operators must reckon with the depletion of their ore reserves that has taken place in meeting war requirements. It is a certainty that the ores mined in the future will, in general, be of lower grade or less accessible than those mined in the past. Faced with the higher costs inherent in this condition, the domestic miner is also faced with a strong trend toward lower tariffs. If this trend results in scaling down the protection that many producers have enjoyed against foreign competition, this in itself is a major problem of the industry.

Gold producers, many of whom have been arbitrarily closed and divested of their equipment, are naturally wondering what price will be offered for their output by the only customer permitted to them. Many of them will have to make considerable investments before operations can be resumed, and will naturally require some basis for justifying new investments.

Thus, problems which many of us have been putting off as belonging to the future are in our laps right now. Consideration can no longer be deferred. Even for those branches of the industry which do not face surplus production or are not divorced from normal consumers, it is folly to postpone consideration of the kind of world in which we shall be living when the war is over.

To help its readers clarify their ideas on the postwar outlook, Engineering and Mining Journal presents herewith the first two of a series of articles devoted to mining problems of the future. The first of these is a study of the general economic climate in which all postwar business must operate. The second offers the editors' opinions on several economic factors of vital interest to the industry. Pursuant to these studies of basic economics the series will consider opportunities for increased efficiency and reduced costs through better technology, and close with the best available opinion on the outlook for the principal metals.

Naturally, it will be impossible to answer questions involving the future to the full satisfaction of all concerned. Nevertheless, the editors believe that the series instituted herewith will go a long way toward conditioning the reader's mind to his future problems.

POSTWAR OUTLOOK

Signs Point to Postwar Prosperity

S. Morris Livingston

Chief, National Economics Unit
Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

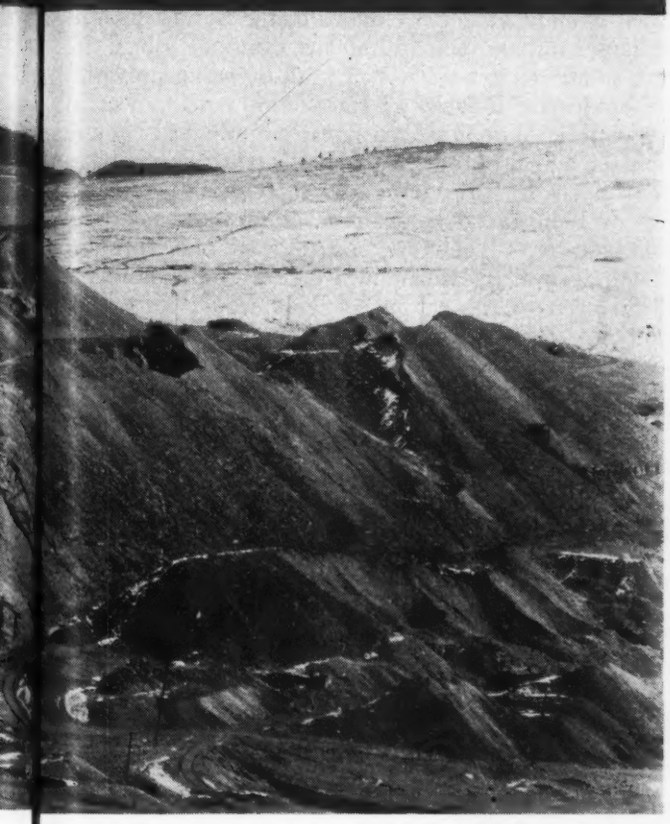
This is the first article of a series discussing postwar problems of the mining industry. These problems are many and varied, and the progress of the war suggests that the time available for advance preparations is rapidly shortening. The fundamental basis for prosperity in mining is a high level of general industrial activity. Mr. Livingston gives evidence showing that a general postwar boom is attainable.

IN PLANNING its postwar activities the mining industry must necessarily be concerned with probable future general business conditions of that period. Without broad background, no detailed appraisal of individual outlook can be formed.

Fortunately an exact forecast of postwar business volume is not essential, as any such specific and detailed predictions are almost certain to be wrong. What is needed is a better understanding of the impact of war on the national economy; a recognition of both the favorable and unfavorable factors now developing and some appreciation of their effect in the immediate postwar period. In short, there is need for a national perspective from which mining, or any other industry, can view its particular problems.

Business leaders and government officials are agreed that a high level of employment must be maintained

Kor MINING



after the war. Suppose, for the moment, this objective can be attained, what business conditions would it create?

What would total business volume be if most of the people who will want to work after the war do have productive jobs? What quantities of raw materials would be required? What sort of market would it create for your products?

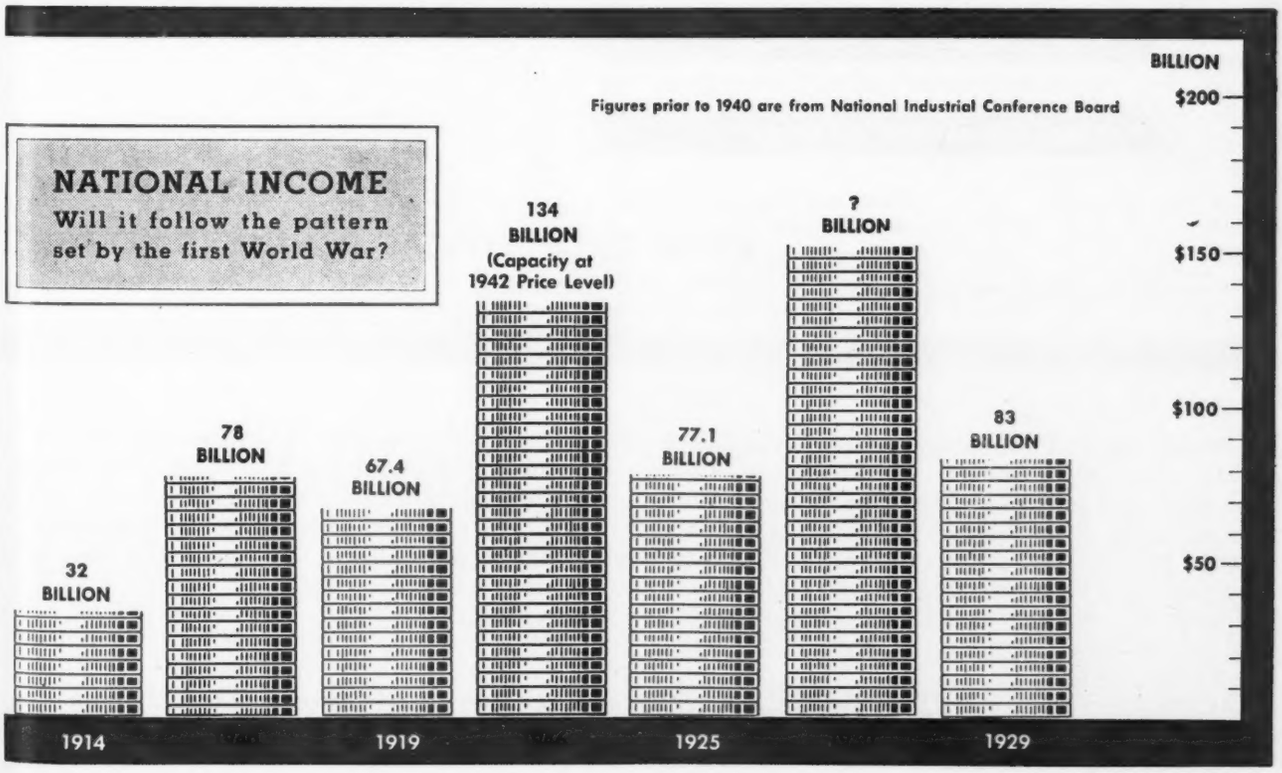
Our Growing Capacity

One of the perspectives frequently lost by a man too close to his daily business problems is that our country's economy is still growing fairly rapidly. Even in peacetime the increase in population of working ages, modified by such long-term trends as longer schooling and earlier retirement, adds about half a million workers to the labor force each year. About 6 million more people were either employed or actively seeking employment in 1940 than in 1929.

The war influences this trend in several ways, but the net permanent effect will be an extension of about the same rate of growth into the postwar period. Assuming that most of the increased employment of women as the result of the war will not carry over into the postwar period, the normal increase in the labor force from 1940 to 1946 will be a little less than 4 million.

The potential productivity of these workers is also increasing as a result of improvements in technique, greater mechanization, and shift of workers to more productive jobs.

For the Nation as a whole, the increase in output per man-hour is about two to three percent per year com-



pounded. Because this growth trend is made up of many small improvements in many places, it has been remarkably consistent over several decades. It is only partly offset by the long-term trend toward shorter hours of work. Even with the shorter hours in 1941, the output per employed person was roughly 25 percent greater than in 1929. Although the war has increased the rate of technological advance such developments will be slow in affecting civilian production. The immediate effect of the war may indeed be an actual decline in productivity, but there is every reason to expect the long-term trend toward increased output per worker eventually to continue.

An Enormous Potential

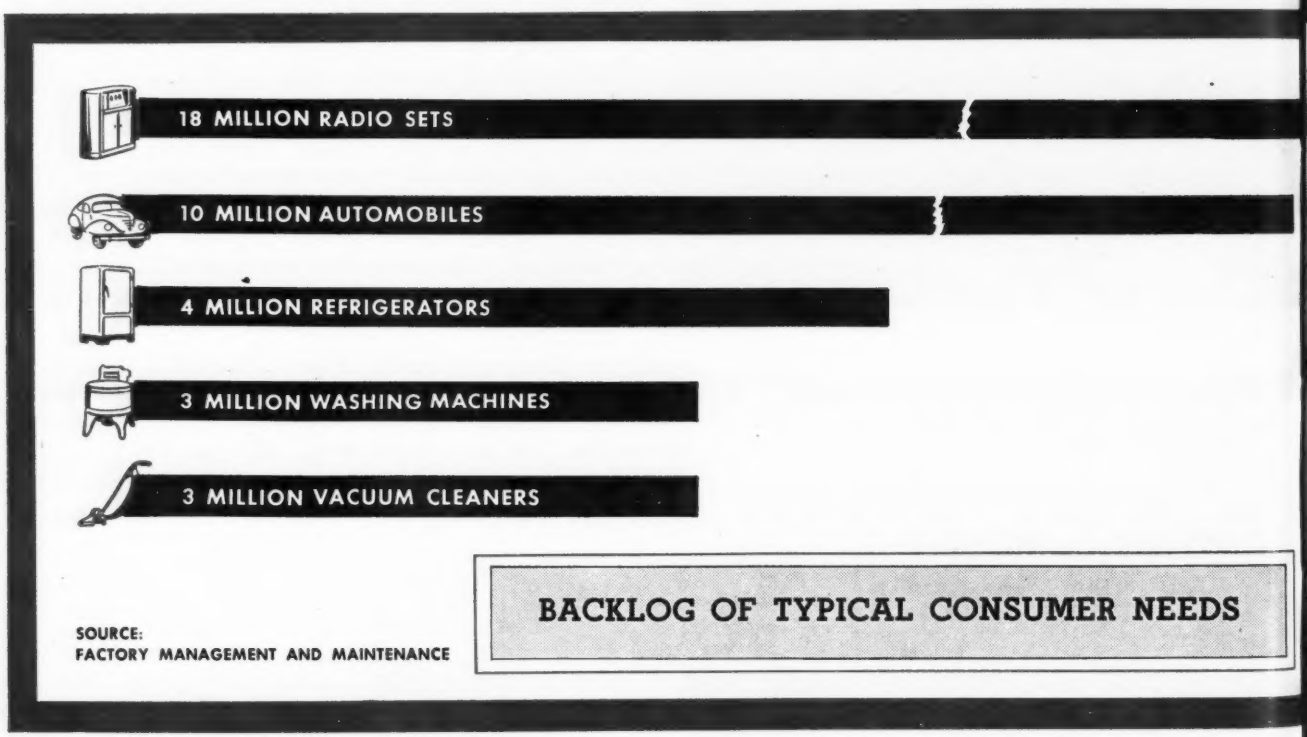
Prior to 1929 the growth of the Nation's output pretty well kept pace with growth in its capacity to produce except in the comparatively brief depression of 1921. This growth trend was obscured in the decade prior to the war by the worst depression this country has experienced since the last century, and by failure to achieve a full recovery from it. The Nation turned out more goods and services in 1940 than in any previous year, yet of all the civilians able and willing to work, only 46 million were employed and 9 million were unemployed. (This compares with approximately 2 million unemployed in 1929 and about 1 million today). In short, the Nation's capacity to produce had outrun its volume of production.

The war proves the power of this capacity to produce. In spite of the diversion of manpower to the armed forces, the Nation's 1943 output of goods and services, measured in 1940 prices, will be at least 50 percent greater than in 1940.

The volume of business after the war will depend on the number of men kept in the armed forces and on the extent of civilian employment. If the armed forces can be reduced to 2 million as early as 1946, and if unemployment is reduced to the normal float of perhaps 2 million who are moving from one job to the next, or are temporarily out of work for various reasons, the productive capacity of the Nation's manpower in 1946 will be 40 to 50 percent greater in physical volume than the actual output in the best prewar year. If, as seems likely, the price level after the war is higher than that of 1940, the dollar volume of business could be even greater. Therefore, because of the constant growth in available manpower and its productivity, a return even to the output of 1940 would leave substantially more unemployment than we faced at the bottom of the last depression.

There are physical limitations on full utilization of this labor supply. In some fields necessary plant is nonexistent; in others conversion to civilian production and adjustment to peacetime markets will be slow.

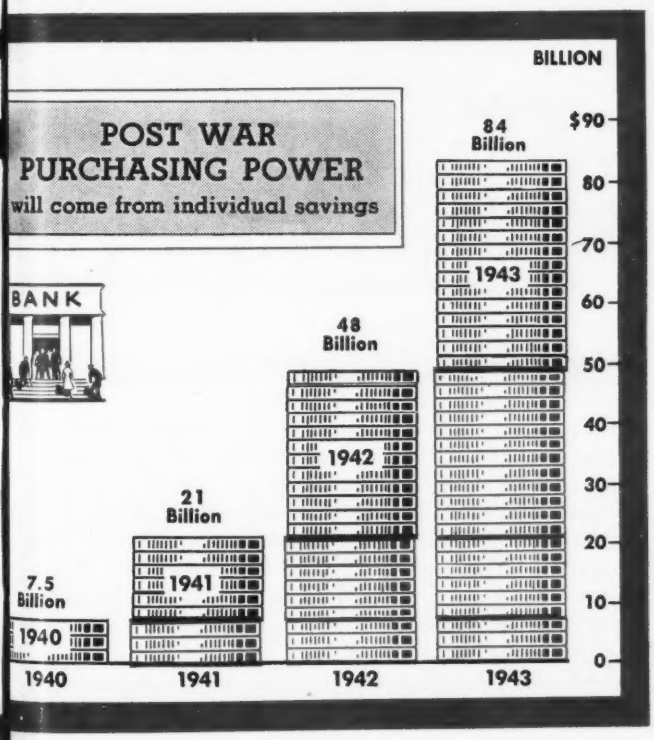
But the biggest question is how to sell such a large volume of goods at a profit. Where is the money coming from? Can business be any more successful in creating demand for a high level of production after the war than it was before? During the war, business has demonstrated its ability to produce more than 150 percent of the 1940 output, but about half the Nation's goods go to one customer whose demand is insatiable. What reason is there to suppose that business can ever distribute an equally large volume of civilian goods? The best reason is the impact of the war itself.



Great Unfilled Needs

Two years ago it was generally assumed that there would be a major depression following the war as the inevitable reaction to a boom, but this reasoning overlooked the fact that this is a different kind of boom. As this war ends, the consumer will have plenty of money in his pocket, for his income has been high but his purchases of goods have necessarily been at depression levels.

The clearest example of deferred demand for goods not available during the war is in the automobile industry. If the war lasts another nine months, new cars will not be produced in quantity until 1945. By that time the normal mortality would reduce the 27 million passenger cars now on the road to less than 20 million. In two more years there would be less than 16 million. Even though the other seven or eleven million may not actually be scrapped, they will be eager candidates for replacement. To make up this deficiency, and at the same time satisfy current replacements, will require several years of higher production than this industry has ever achieved. These accumulated demands for durable goods are very important to the mining industry.



Though this deferred demand is important, those who recall the wild calculations made in 1932 will agree that it can also be a mirage. Deferred demand may make people more ready to spend their money, but it does not, in itself, put the money into their pockets. We are back to the earlier question: Where is the money coming from?

Also, the accumulation of wants is determined only in part by the things people bought before the war and cannot get today. Even more important are the things they could not afford before the war but can afford if a high level of productive employment is maintained after the war.

High Incomes and Housing

The significance of the latent purchasing power of this high income can be illustrated by what could happen to the volume of residential construction if the present income per family is maintained. This is particularly significant because the relatively low volume of construction was the chief reason for the failure to achieve a full general business recovery in the thirties. The average family spends about one-fifth of its budget, after savings and taxes, for housing. Barring wartime restrictions, this holds true almost regardless of the size of a family's income.

There were 20 percent more non-farm households in 1940 than in 1930, but income per family was still substantially below 1929 and people could not afford to pay as much for their housing. Census figures show that there was a decrease of 4.3 millions, or 45 percent, in the number who could pay over $40 per month for their housing. There was an increase of 8.7 millions, or 60 percent, in the number who could not afford to pay as much as $40 per month.

This one fact explains what was wrong with the residential construction industry in the thirties. The net increase in nonfarm families was greater in the five years 1936–40 than in any five years during the height of the construction boom in the twenties. But most of this increase was concentrated in the low-income group which could not afford new construction. Throughout the decade the aggregate supply of housing exceeded the demand over most of the price range where new construction could compete with existing dwellings.

As a result the number of new dwellings constructed during the decade was considerably less than the increase in households and many of the new dwellings were of the cheapest sort. There was practically no replacement demand. Obsolete and dilapidated structures which should have been torn down were not replaced because the demand for very cheap housing exceeded the supply.

Today the average income per family equals or exceeds that in 1929, and if this purchasing power is maintained, the conditions of the last decade could be exactly reversed. Millions of families could afford new construction, and several millions of the most unsatisfactory dwellings, lacking a market, would have to be replaced. The volume of new construction could considerably exceed the increase in population since 1940.

The outlook for residential construction depends of course on a great many other factors, notably what the construction industry does in the way of reducing costs and improving distribution processes. The only point to be made here is that, if we do have a boom, it will be due not so much to the curtailment of construction during the war as to the inherent desire of people to improve their living standards above the prewar level in line with their higher incomes.

Large Savings Accumulated

Whether deferred or otherwise, effective demand depends on purchasing power. This leads us again to the earlier question: Where is the money coming from?

Perhaps the most important factor affecting postwar, as against prewar, conditions is the enormous quantity of liquid, spendable reserves accumulated by individuals as a result of wartime saving. This force may be constructive or it may be destructively violent, but must have a part in postwar plans.

Prior to 1941 individuals had never saved as much as 10 billion dollars in any one year. In 1942 they saved more than 25 billion dollars. Of that total about three and one-half billion dollars was used to retire installment debt; another three to four billion went into equities in real estate, insurance, and miscellaneous securities. About 20 billion dollars was added to individual holdings of currency, bank deposits, and Federal Government bonds. Total individual savings in 1943 will exceed 30 billion dollars. If the war lasts through 1944 the total for the three years 1942–44 will be substantially larger than the total income of individuals in the best prewar years.

In the three years ending December 31, 1943, individual holdings of currency, bank deposits, and Government bonds will have increased roughly 60 billion dollars. The additions to the *individual* holdings of these liquid assets in the one year 1943 will be larger than the *individual* and *corporate* accumulations during the two-year period April, 1917, to June, 1919, including all of the first World War.

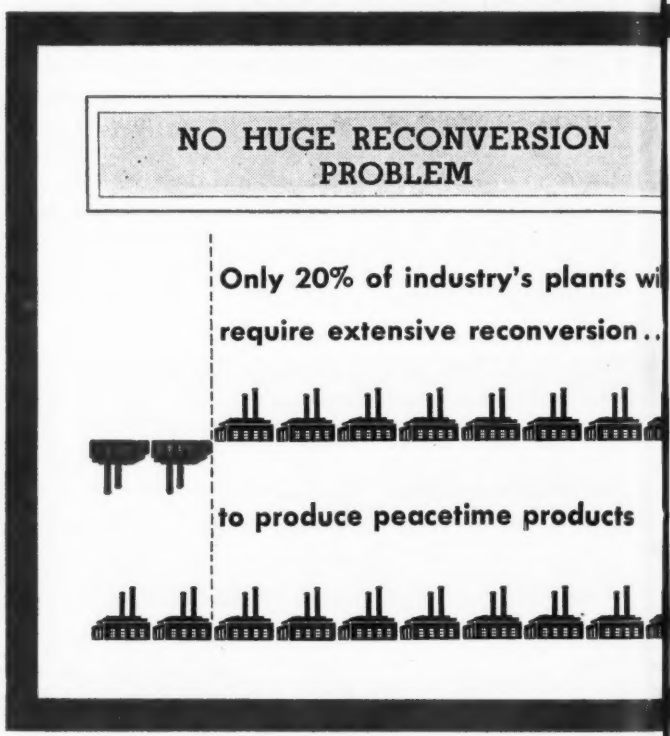
These funds constitute a reserve with which people can buy new things or maintain current expenditures in spite of temporary unemployment. More important, however, is that they enable the consumer to spend more of his current income, for he will already have accumulated his reserves against the proverbial rainy day.

Ample Purchasing Power

In appraising the importance of these liquid assets it is necessary to remember that the production of goods after the war will in large measure provide the wages and other income to buy these goods. Gross receipts from the sale of goods and services produced are distributed among three groups: (a), they are used to pay wages, interest, dividends, personal expenditures of the self-employed, and other income payments to consumers; (b), they are used to pay taxes to the Government; or (c), they are retained by the producer as undistributed profits, depreciation, and other business reserves. Since all of the costs of production fall into one of these three categories, the total payments to these three groups in any year must necessarily equal the total value of goods produced.

During the war, Government purchases greatly exceed taxes. This means that the Government is withdrawing more goods and services than income from the economy. A balance is achieved between the total value of goods produced and total expenditures for these goods because both producers and consumers are saving a large part of their incomes. In fact, the difference between taxes and Government expenditures is a measure of the savings of producers and consumers taken together.

In the postwar period the same balance must be achieved. The expenditure of private savings necessary to maintain such a balance will equal the amount by which taxes exceed Government spending. The major part of the taxes paid by consumers and producers will be returned to them via Government purchases of goods and services. Only that part of the taxes which is not so returned will serve to reduce the accumulated savings of consumers and producers. During the first three or four postwar years any Government surplus is bound to be small relative to the wartime accumulations of savings. Postwar taxes are not likely, therefore, to reduce materially the amount of savings held by consumers and producers.


NO HUGE RECONVERSION PROBLEM
Only 20% of industry's plants wi
require extensive reconversion..
to produce peacetime products

Producers as a group will probably have to spend part of their savings to finance their reconversion to peacetime operations. In all probability this expenditure of savings will be more than enough to maintain a balance between total production and total expenditures.

It follows that a net expenditure of even a small part of consumers' reserves would create a demand for all of the goods produced. The real danger is not that buying power in that period will be inadequate, but that the accumulated buying power of both consumers and producers will generate a frantic attempt to buy more goods than can be produced, thereby causing inflation.

Viewed in this light, the added purchasing power of these funds assumes a very large proportion. The major problem immediately after the war will be not to create purchasing power, but to control it.

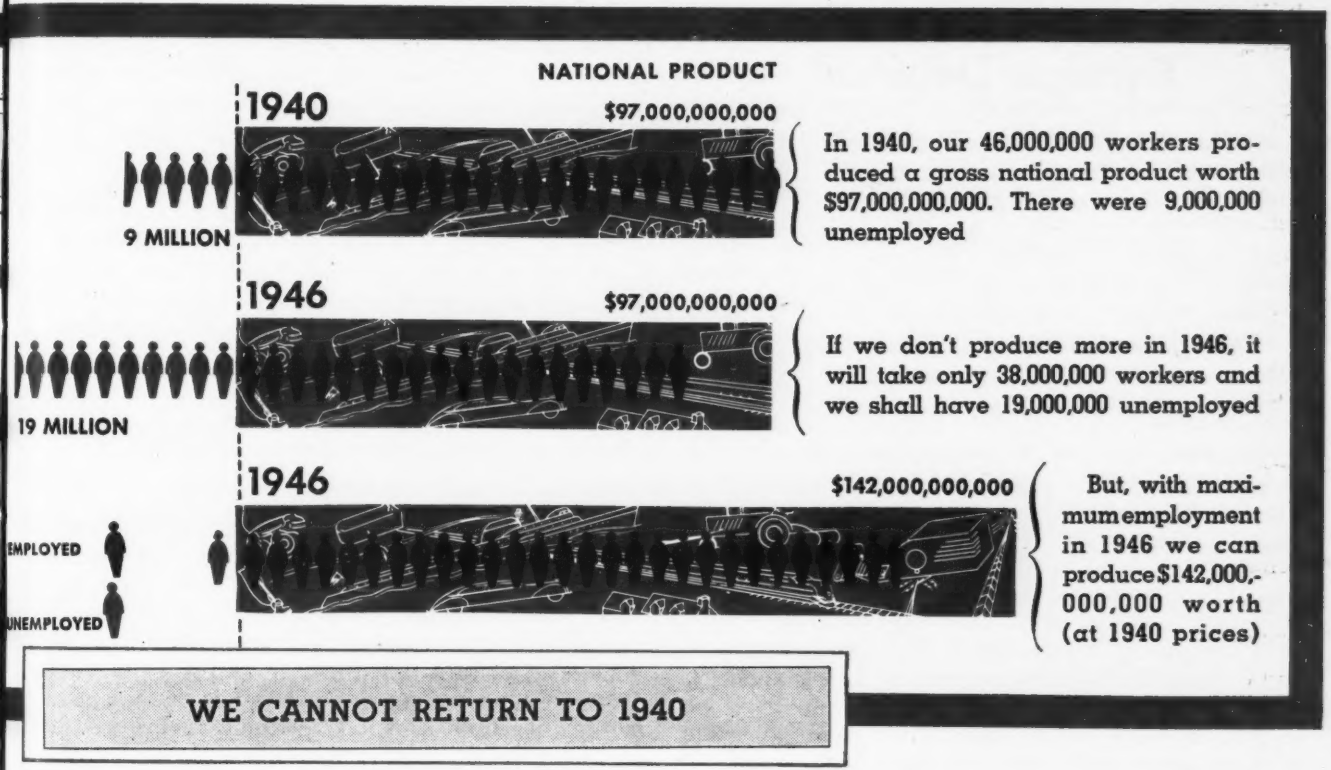
A fact commonly overlooked is that, besides indi-

vidual savings in 1942 and 1943, corporations have accumulated over 16 billion dollars in unused business savings.

The outlay for manufacturing plant equipment in 1941 and 1942 was nearly as large as the total of the preceding ten years. Where does this leave the important market for producers' capital goods? Have we built most of the new facilities we will need for the decade following the war?

Industries which provided over half the prewar market for capital goods have had their outlays curtailed rather than expanded by the war. These include food, textiles, apparel, lumber, paper, printing, publishing, stone, clay and glass products, oil well drilling, and a number of other industries.

To cite one example: The biggest single item in the prewar total of 2.5 billion dollars per year for manufacturing and mining plant and equipment was between


NATIONAL PRODUCT
1940
$97,000,000,000
9 MILLION
In 1940, our 46,000,000 workers produced a gross national product worth $97,000,000,000. There were 9,000,000 unemployed
1946
$97,000,000,000
19 MILLION
If we don't produce more in 1946, it will take only 38,000,000 workers and we shall have 19,000,000 unemployed
1946
$142,000,000,000
EMPLOYED
UNEMPLOYED
But, with maximum employment in 1946 we can produce $142,000,000,000 worth (at 1940 prices)
WE CANNOT RETURN TO 1940

Curtailed Capital Outlays

To answer these questions, and to avoid having our perspective distorted by particular situations, we need a picture of the whole capital goods market.

In the four years 1937 to 1940 an average of between seven and eight billion dollars per year was spent on producers' plant and equipment. In round numbers this was broken down as follows:

	Billion Dollars
Manufacturing and mining	2.5
Public utilities	1.5
Agriculture	1.0
Retail and wholesale trade, professions and a host of service industries	2.5

For the three years 1941 to 1943 the average annual outlay for manufacturing and mining will be almost three times as large. There has been no such expansion in the other fields which constituted two-thirds of the prewar total. These people are being made to wait until after the war to buy the new facilities they need.

The same discrepancies exist within manufacturing. 500 and 600 million dollars for oil and gas well drilling. In 1942 the number of wells drilled declined to less than two-thirds of the prewar rate.

There has been no such curtailment of capital expenditures in the mining industries, but neither are they likely to find themselves with an overabundance of proved reserves at the end of the war. On the contrary, they may find it necessary to spend substantial amounts to develop future sources of supply adequate to meet the demands of a high level of business activity.

Many War Plants Unusable

Do not forget that the present total national output would have been impossible without enormous outlays for new plant and equipment in a few specialized war industries, and that conversion of many of these plants to civilian production will be difficult, if not impossible. This is true of explosive and shell-loading plants, and there are many other examples. Even in plants which can be converted to civilian production, it may require substantial additional outlays to do the job.

Aside from this difficulty, there are other reasons why

wartime expansion will not be adequate to turn out an equally large volume of civilian goods. Multiple-shift operation, long hours of overtime, and the overloading of inadequate and obsolete equipment are not likely to be any more popular or more practical after the war than before. In general the physical plant of this country is being operated at considerably more than the optimum rate which would prevail if business were free to reduce costs by building new plants or buying additional equipment. In the aggregate, large outlays for capital goods in many fields will be required in order to reach a high level of civilian output after the war.

Foreign Demand

In other countries there is the same accumulation of wants and the means of payment to satisfy them. The British civilian also has deferred demands and a large part of British war outlays is also being financed through his purchase of war bonds. There is the same pent-up demand throughout the British Empire and to a lesser extent in other warring nations. Where the war has caused widespread destruction of civilian property the need for rehabilitation is so great that it is almost a guarantee that some means will be found to pay for it.

Aside from the accumulation of purchasing power to pay for goods in their own currencies, pounds or francs or lira, some of these countries have also accumulated the means to buy goods in the United States in the form of liquid assets transferred here for safekeeping before the war. Our large purchases of raw materials abroad have built up substantial dollar balances particularly in some of the Latin American republics.

In the long-run, the prosperity of the rest of the world, and its ability to buy from us, depend to a large extent on prosperity in this country. If we maintain a high level of productive employment in this country, we will need to import much more than the prewar amounts of raw materials and other commodities which cannot be produced advantageously in this country. Thus we will create the dollar balances to enable other countries to buy from us the things they want so much.

Whether we can continue to sell more abroad than we are willing to buy will depend first, on the extent to which we choose to lend or give for the relief of war devastated areas, and second, on the establishment of a sound basis for international investment. Given such a basis, the opportunities for profitable investment in the development of other countries are almost unlimited.

The Reconversion Period

So far the outlook appears very promising. Barring some temporary difficulties in the way of converting to civilian production, the people who will be seeking employment after the war are capable of turning out a volume of production far above any prewar level.

The potential demand for that output exists in the form of (a) the deferred demand for goods not available during the war; (b) the desire of consumers to increase their scale of living in line with the high incomes that go with full production; (c) the need for new plant and equipment in many fields in order to increase capacity and to lower costs, and (d) a similar accumulation of demands throughout the world.

The necessary buying power will exist in the high incomes which people will have at the end of the war supplemented by an enormous accumulation of savings and by the accumulation of corporate reserves to be spent for reconversion.

The real danger is not another 1932 depression immediately after the war. The real danger is a peculiar combination of boom and depression. The maladjustments brought about by the war may leave business unprepared to produce in adequate quantity those goods which consumers will want. Thus certain industries and communities may have large numbers of unemployed while others work overtime to fill a demand for more than they can produce.

To the extent that there is unemployment because of bottlenecks in physical plant, because of marketing, engineering and organization problems of conversion to peacetime output that have not been solved, because people are slow to move from blighted areas to communities where there are employment opportunities, the purchasing power of the incomes created by full production will no longer exist. This conversion job involves directly only a fraction of the total employment in war production, but it requires much more than the mere reconstruction of an automobile assembly-line.

The Critical Tenth

About four-fifths of all civilians now employed are still in essential civilian production or in war production in which no serious plant reconversion is involved. This includes agriculture, the utilities, most retail and wholesale trade, a broad group of service industries, the manufacture of such items as food, clothing, fuel, steel, lumber, and cement.

These people are not automatically thrown out of work when war production stops. Whether or not they will continue to work depends very largely on what happens to the remaining one-fifth of the Nation's manpower.

About one-tenth of total civilian employment is in industries largely or wholly converted to war production. It includes automobiles, refrigerators, and office equipment. The consensus is that such industries can be turning out civilian goods in quantity about six months after beginning reconversion. Some of their employees will remain to reconvert but there will be many unemployed during this period.

The remaining tenth of the Nation's business contains the most serious conversion problems. The output of a number of commodities such as airplanes and ships has been expanded so greatly that there is no reasonable possibility of finding peacetime markets for more than a fraction of present production.

Fortunately, a lot of people leaving these war plants can find work in the same communities in garages, resturants, barber shops, and laundries providing services now often unobtainable. At the peak of the war effort, employment in retail and wholesale trade, all of the service industries, construction and similar occupations

THE LESSON OF THE LAST WAR

THE VALUE of our total output of goods and services almost doubled between 1914 and 1918. More than half of this expansion was merely an increase in price, but there was a large gain in physical output, which, however, was relatively less than during the present war.

The conversion to war production was less complete. There was a smaller expansion in new plant and equipment. There were about half as many men in the armed forces as are now estimated for the end of 1943. There was less drastic curtailment of nonessential industries.

Hence, the reconversion problem was less than it will be after this war. Reconversion was largely completed and the returning soldiers were largely reemployed by mid-1919. The total output of goods and services for the full year was little, if any, below 1918.

The demand for goods and the accumulated savings were also less important than they will be after this war. Nevertheless, production of consumers' durable goods in either 1919 or 1920 was almost double the best year before 1914. Expenditures on producers' capital goods in these years were more than 50 percent above the prewar level.

Price controls were less drastic and effective. They were removed promptly at the end of the war. The price inflation during the following eighteen months was as great as during the eighteen months we were in the war. This led to the speculative collapse in 1920, a sharp deflation of prices and a comparatively brief recession in business volume. By 1922 the physical volume of business was at a new peak, following which the upward trend was not seriously interrupted until 1929.

Residential construction in 1919 was already above the prewar level, even when measured in terms of dwelling units rather than dollars. After a brief recession the upward trend was resumed. By 1925 the volume was double the best prewar year and there was no substantial curtailment until ten years after the war.

The purchasing power of the national income, assuming an equally good job of reconversion, will be greater relative to the best prewar year.

There is no reason to suppose that the exact pattern of events after the last war will be repeated. In several respects the impact of this war is greater. The same factors are present, but all, pro and con, are of greater magnitude. Nevertheless, there is room for the observation that major wars usually have initiated rapid and extensive changes, and that they usually have been followed by substantial increases in national income and production over the prewar levels.

will be substantially below normal. The natural outlet for many of those now working in war industries is in these other occupations. The danger is that the latter will not expand fast enough when the necessary manpower and raw materials are again available to them.

Inasmuch as the return of men from the armed forces will be just about offset by elimination of overtime and loss of those civilans who probably will not want employment after the war, the problem centers around getting two-tenths of the civilian manpower back in peacetime production before their unemployment can affect the market for other industries and thereby throw still others out of work.

Some unemployment in this period appears inevitable. Whether it can be held to manageable proportions depends on (a) preparations by individual business to resume civilian production on an expanding scale as soon as possible; (b) the possibility of taking some steps toward reconversion before hostilities cease; and (c) the purchasing power in the hands of the consumer and his willingness to spend it.

In addition to the consumer's accumulation of liquid assets there are the unemployment insurance reserves, special payments to returning service men, and certain other forms of relief for those who may be temporarily out of work. A reserve of useful public works can be of some help provided the projects are ready to start at a moment's notice.

Confidence Necessary

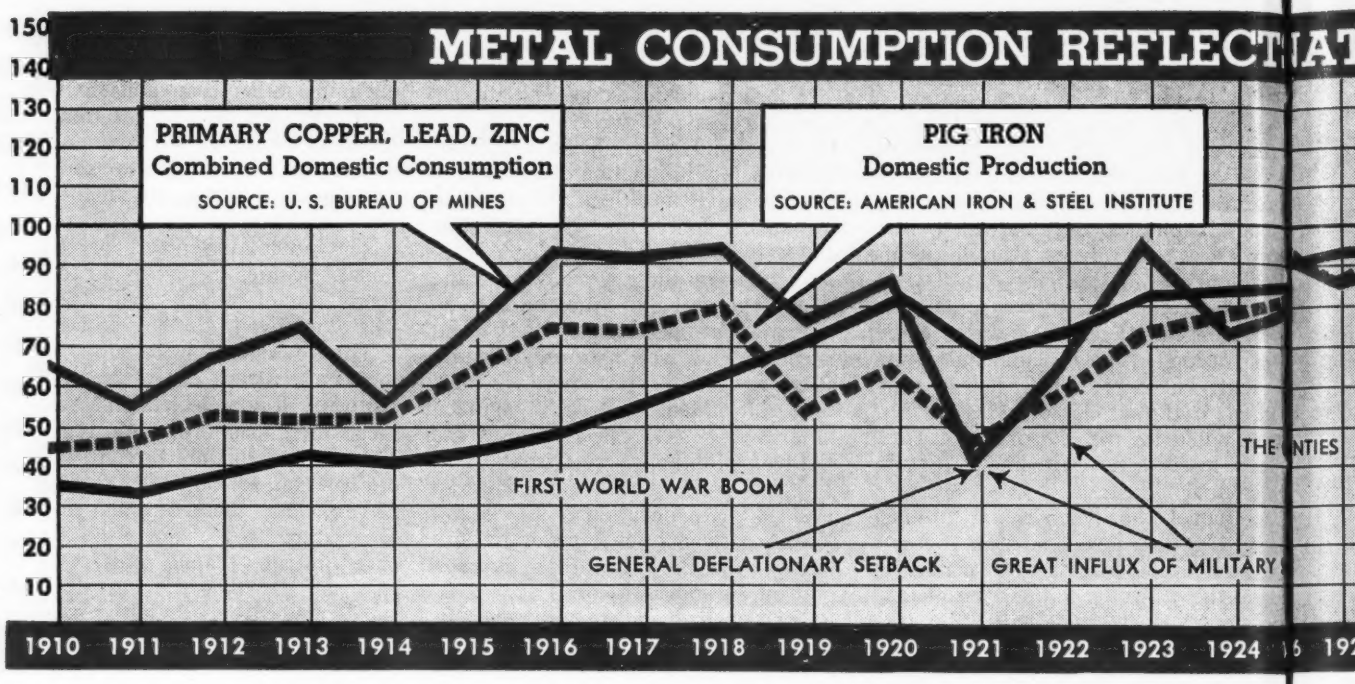
This aggregate buying power is quite impressive, but it will be inadequate without the confidence of the consumer. If he is one of those thrown out of work, he needs some assurance that there will be a job waiting for him when the reconversion process is completed. Where an outright promise is impossible, he needs some understanding of the plans for expanding production and the job opportunities which this will create. If the opportunities do not exist where he is, he needs all of the public and private help that can be given in finding a job as quickly as possible somewhere else.

The length of this transition period depends largely on the speed with which private enterprise expands production to meet consumer demands; not only those enterprises converted to war work, but also those which mushroomed during the war and a host of small businesses not yet started.

In preparing for this expansion it seems reasonably safe for management to assume that the physical volume of national output will not fall below the 1940 level for any protracted period. In addition to the impact of the war creating a demand for this output, there is the growing conviction of the American people that mass unemployment must be eliminated at all costs. No political party can stay in office which does not accept this conviction.

At the other extreme, the Nation's capacity to produce, when most of the men from the armed forces are reabsorbed in civilian life, will be 40 to 50 percent above the production in 1940. This is an estimate of capacity and not a prediction of what may actually be achieved. During most of the twenties actual production was very close to a similarly calculated capacity. At the bottom of the last depression it was only 60 percent of capacity. Current production is over 100 percent.

While wartime advances in technology may cause widespread substitution of one material for another, the total consumption of minerals will be related to the total production of finished goods. Therefore it seems reasonable for the industry in general to be prepared to meet a postwar demand at least as great as in 1940 and quite possibly substantially greater.



Important Factors in the Outlook

Elements in the problem of the future warrant more optimism than exists in the industry

IN A PRECEDING ARTICLE S. Morris Livingston has presented evidence that a postwar boom is in prospect, provided that ponded-up purchasing power is not dissipated through mismanagement.

However, it is not enough to understand the probable economic climate in which postwar business will operate. Progressive mining men must also form opinions on several factors, such as tariff and metal surpluses, which are bound to affect their operations. The industry would die on the vine if it should wait for final answers; it must go ahead on the basis of the most logical assumptions it can make.

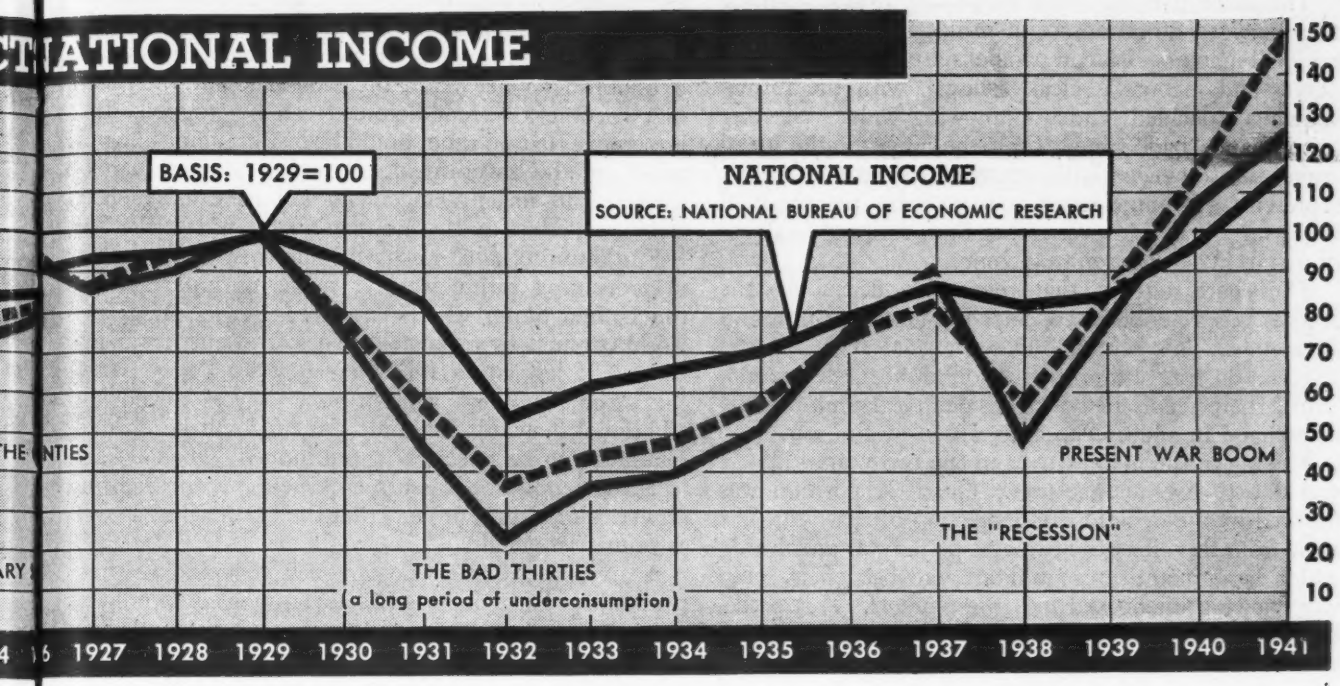
The purpose of this article is to bring future problems into sharper focus. The editors do not claim to be prophets. If the reader disagrees with our conclusions, at least in so doing he must clarify his own ideas.

Two Big "Ifs" Will Be Surmounted

There are two principal ways in which we may rob ourselves of the benefits of a postwar boom. One is to permit uncontrolled inflation to wipe out accumulated purchasing power. The other is to fail to re-employ some five million war workers, before their plight causes a widening spiral of distress.

The editors do not have great fear that either of these possibilities will materialize sufficiently to cancel out the indicated boom. It has been demonstrated that inflation can be controlled if the public and government are determined to do so. The emphasis we are likely to place on the political aspects of the stabilization program tends to obscure the fact that the tide has been held back fairly well. Undoubtedly, with powerful groups striving to breach the dike in favor of the minorities they serve, some holes will continue to be made and gradual inflation will develop. This seems all to evident while government officials are hunting for technicalities to evade the firm policies they profess to espouse. However, we believe that as it becomes more evident that we cannot have our cake and eat it too, a groundswell of public resentment will develop that will stiffen the spines of our political leaders. Therefore, we hold to the viewpoint that, even with hesitant leadership, there is enough collective common sense among the American people to prevent runaway inflation.

In regard to the second possibility, that of providing



for Mining

employment in haste, we are sustained by our faith in the American genius for production. American enterprise has always made phenomenal achievements when reasonable assurance of markets exists. Without knowing the means in detail, we feel certain that business men will surprise all of us by their ability to provide jobs, with consumers clamoring for goods and services.

Moreover, there is every reason to expect that the war will end more quickly in the European theatre than in the Pacific. If this occurs, a part of industry will be able to return to peacetime production while the war with Japan is still in progress, thus cushioning the shock of reconversion.

With a great pool of pent-up demand as a backlog, reconversion will not constitute as difficult a job as that already accomplished in the war production program. Why should we doubt that the achievements of the future will be less than in the past?

Mineral Consumption Likely to Remain High

Assuming that we shall have a postwar boom, what will be the status of mining in such an economy? Domestic mining faces on the one hand inflated wage levels, greatly expanded capacity, colossal inventories accumulated during the war, deferred development costs, reduced ore reserves, lower grade ores, mountainous tax burdens, and the threat of lowered tariffs—all depressive factors. On the other hand, the outlook is considerably brightened if we can look forward to a much higher level of consumption than we have ever enjoyed in peacetime. Such a prospect will do much to resolve the problems that now loom before us. Indeed, it seems quite possible that whereas we now seem to be burdened with excessive costs, inventories, and capacity, an only moderately long-range view may convert the fundamental picture into one of demand. The primary job before the industry may prove to be one of finding enough minerals to satiate the colossal appetite of our expanding industrial organism.

In the postwar economic picture which is rapidly taking shape, three factors particularly favorable to mining appear. One is an anticipated "bulge" of investment in producers' goods, which will naturally favor the heavy industries and thus the products of the mines. Despite the large plant and equipment additions of wartime, the war and ten years of depression have caused important deficiencies in plant additions and modernization. Given the prospect of good times, producers can be expected to make liberal expenditures to improve efficiency and enlarge capacities. Second is the unprecedented backlog of demand for consumers' durable goods, which will likewise draw heavily on minerals. Third is the expected high level of construction activity in the postwar period. The deficiencies due to many years of subnormal construction should result in a housing boom greater than any yet experienced.

In the first postwar year to achieve full production, the Department of Commerce anticipates expenditures of $15 billion for producers' goods, $17 billion for consumers' durables, and $18 billion for construction (all at the 1942 price level). This compares with 13-year prewar average expenditures for these purposes of less than six, seven, and four billion, respectively. In other words, those elements in the consumption picture which relate most directly to minerals (ex fuels) are expected to increase as much as 2½ to 4½ times the prewar average.

The accompanying chart shows the 30-year relationship between domestic use of primary base metals and national income. A broad parallelism between the metal curves and income is clearly shown, with the former showing a decided tendency to swing wider, reflecting "good" and "bad" times. Over the 30 years, the metal curves sag somewhat with reference to income. If this represents a genuine trend, it is probably the result of increasing scrap turnover rather than a lesser total use of metals in comparison to income.

The chart suggests that the whole decade of the thirties was a period of considerable underconsumption of metals. This reflects the subnormal status of the heavy industries and construction during this period. Thus, there seems to be a considerable latent backlog of demand in addition to that caused by the war.

The sag in the metal curves in the two years 1921–22 was due to two main causes. The 1921 position was lowered by the deflationary depression of that year, but aside from this effect the two-year period was one during which large quantities of military and battlefield scrap were flowing unchecked into the markets. This precedent should be ample warning of the conditions metal producers will face if they fail to insist on rational administration of the metal surpluses now accruing.

One comparatively favorable aspect of the present situation is that metal stocks in the hands of consumer industries will probably be relatively lower than after the last war because of the more stringent controls which have been applied. Another is that we shall avoid a deflation to the extent that we forestall inflation.

Given competent handling of wartime surpluses, our general conclusion from a study of the chart is that mineral products should enjoy a good share of the total demands, if we have a postwar boom. This will be particularly true if a sound basis for finance can be set up to permit us to participate freely in world reconstruction.

Wartime Surpluses Must Be Stockpiled

One of the most worrisome factors in the outlook is the problem arising from the great mineral inventories which have been built up for war purposes. If these supplies should be dumped into the markets indiscriminately, as was done after the last war, nothing less than chaos would result. These inventories exist in several forms, as ores, concentrates, ingot metal, scrap, and as finished goods which will presumably be available for salvage after the war.

Considering the huge requirements of an expanding world economy and the great need for minerals in reconstruction, there is no logical basis for dumping these inventories in sufficient amounts to disrupt mining and smelting activities, despite the large tonnages involved. In fact we take the view that, if the industry brings the attention of government officials forcefully to the situation, it is inconceivable that the government can do such a foolish thing as to demoralize basic industries.

This is not a situation which should be permitted to suffer neglect. The government failed to control the flow of military scrap after the last war, notwithstanding the protests of the industry. At the present time the Army is publishing impressive catalogs of surplus equipment and parts being offered for sale. If nothing is done to establish a policy before the end of the war, the trickle may become a torrent before it can be stopped. It is imperative that no time should be lost in urging a logical policy on the government. If such a program can be worked out, its announcement will have a beneficial stabilizing effect on the industry for the rest of the war.

Furthermore, until we have some trustworthy means of preventing future wars, it seems unthinkable that the United States will fail to heed the lesson of two world conflicts by risking shortages of essential war materials. If legislation for emergency stockpiles passes, the surplus problem will be more or less solved and additional demands for some minerals will be created. Naturally, to be effective in the industry's behalf such legislation must cover surpluses held by the fighting services and junk returned from the battlefields, as well as primary minerals.

Apart from the issue of emergency stockpiles, the only reasonable course open to the government is to hold its surpluses off the markets, disposing of them at such times as demand is strong enough to take them without unsettling the mining industry. The very magnitude of the inventories is in itself a source of protection, as to dump such amounts into the markets would cause a debacle that even the most reckless administrators could not justify to the public. Beyond the injury done to the industry's functions, employment, and depreciable properties, there would be costly abandonments and wasteful exploitation of mineral reserves, with no advantage to anybody. Such developments would increase future costs of production and hasten our dependence on foreign mineral supplies. Even the consumers who might enjoy temporary low prices are also taxpayers who paid high prices to acquire these inventories. Moreover, in the complicated price structure of modern industry, only a portion of the price-reduction benefits would reach ultimate consumers.

Therefore, we flatly predict that government mineral surpluses will not prove to be the obstacles that many producers fear. To assume otherwise is tantamount to saying that the government will be run by lunatics and the industry will be indifferent to its own vital interests.

Government Will Not Retreat From Industry

The editors would be only too pleased to report any evidence of stoppage of the trend toward government encroachment on industry. Unhappily, we cannot honestly forecast that the government will start taking its foot out of industry's door.

One of the principal reasons for this opinion is the habit developed in recent years by business men and the public of seeking recourse for their ills through government assistance. It is thoroughly illogical to ask the government to become a partner in solving problems, but to stay out in all other respects. As long as we insist on taking industry's problems to government we can expect to pay the piper.

It is fantastic to assume that common sense will permit complete relaxation of government economic controls as soon as the war is over. In the matter of inflation for example, the strongest pressure will come in the reconversion period. Purchasing power will be at a maximum, the patriotic urge to keep from rocking the boat will be lessened, and there will be consumer demands vastly exceeding supplies. To abandon the stabilization program at that time would do much to squander our chances of enjoying a postwar boom.

The government already has both feet in industry's door through its ownership of a considerable portion of the country's plant capacity. The mineral industry has at least an average share of these plants. Therefore the most immediate aspect of the problem resolves into what disposition the government will make of them.

We submit that the government cannot directly operate these plants effectively because it has neither the managerial nor technical skill to do so and cannot acquire the same except over a period of years. Thus, whether it continues to own the plants or not, it will depend on private organizations to operate them.

Through Secretary of Commerce Jesse Jones the government has already given a hint of future policy concerning these plants. If Congress concurs, they will be offered for sale to private parties, but not at bargain prices. Those left in government hands will be operated by or in behalf of the government if such operation is necessary to prevent unemployment. Naturally, nobody can now define what criteria will govern the basis for settlement, but it is a safe assumption that there will be a few cases where outsiders will have logical reasons for outbidding the present operators. Thus, the plants do constitute a competitive threat to the owners of less efficient ones, particularly if these owners are not operating any of the government plants.

Assuming for purposes of argument that the government will undertake to operate some of its plants after the war in order to provide employment, it seems likely that the mineral industry portion will be fairly high on the list. It seems sheer nonsense to plan on making military equipment for which there will be no apparent use and which will be obsolete in a few years. The same would be true of any other products subject to quick obsolescence or decay. On the other hand, to make concentrates or ingot metal converts labor and resources into commodities which are reasonably indestructible and would not become obsolete. Thus, if widespread unemployment threatens, the mineral surplus problem is likely to be aggravated.

There can be little doubt that Congress is the public's strongest ally in government circles against further intrusion into private functions. Congress is deeply worried over the growth and ambition of the vast bureaucratic monster whose tentacles are entwined throughout the length and breadth of the federal government. It is also evident that state governments foresee complete emasculation of state sovereignty if the trend is not reversed. Both Congress and the states would welcome a public awakening to the dangers in this situation.

Broadly speaking, we take the view that the public will be unfriendly to further government encroachment into the field of private industry unless conspicuous unemployment develops. In that event, they will undoubtedly demand government action. The broad problem thus resolves into the capacity of private enterprise to provide reasonably full employment. Probably, during the anticipated postwar boom this will present no serious problem because of the great backlog of consumer needs. In that period of grace, private enterprise will have to find the means of so spreading purchasing power that industry will not suffocate on its own output.

Long-Range Outlook Points to Lower Tariffs

No single economic factor weighs more heavily in the outlook affecting mineral producers than future tariff policy. None is more difficult to analyze, the problem being not only economic but also political.

It would be convenient to fall back on the traditional tariff policies of our major political parties and assume that the tariff outlook can be resolved by predicting which party will be in power after the war. However, it is our opinion that Congress will be reluctant to restore tariff to the status of a political football. Congress knows that it is poorly equipped to give expert consideration to this intricate problem; also that to bring tariff rates to its floors results in shameful logrolling. We believe that Congress will continue to delegate the details of tariff-making into the hands of a group of non-partisan specialists, such as the trade agreements organization pretends to be. Considering that we shall probably be unable to seclude ourselves from international affairs as we have done for more than a hundred years, more expert and impartial tariff administration looms up as a necessity.

Being convinced that the domestic producer is best served by a candid appraisal of facts, we state our opinion that the long-range outlook is for lower tariff protection than he has enjoyed in the past. This belief is based on two main premises.

First, is the circumstance, not new but still unexpressed in tariff policy, that we are a creditor nation. We cannot escape this rôle in our time except by wasting the wealth which it has been our good fortune to inherit. As creditors we can scarcely expect foreigners to pay interest and dividends, repay debts, and also hurdle a tariff wall with their goods. In other words, a long-range, high-tariff policy is almost certain to make foreign loans uncollectible.

Second, is the situation resulting from advancing depletion of our mineral resources, accelerated by the gargantuan demands of war. Broadly speaking, in the past consumers have not objected violently to the charges imposed on them by mineral tariffs because the charges have been moderate and have enabled a very desirable national self-sufficiency. However, our expanding national economy and diminishing mineral supply promise to make self-sufficiency more and more costly to support in the future.

The tariff problems of many mineral producers are complicated by competition from substitute materials. The fact must be faced that in some cases the price benefits sought through tariff protection can be obtained

only by sacrificing portions of the markets to substitutes. Examples are the competition which copper and zinc will face from aluminum and plastics.

The experience of two world holocausts has demonstrated that political isolationism means passive acceptance of periodically slaughtering our young men, plus untold economic waste. It is folly to presume that we can abandon isolationism politically but retain that doctrine economically.

Tariffs Will Not Be Drastically Changed

Despite the long-range outlook, we do not believe that isolationism is as dead as it presently appears to be. This is a dismal augury considering the pressure of world problems, but merely to disavow isolationism does not make practical internationalism. The emotions of wartime have made Americans condemn their traditional attitude, but the hard fact remains that we are doing precious little international thinking and are thus operating in a mental vacuum. Rejection of isolationism will be an empty gesture until we learn to assume the responsibilities and accept the consequences of participation in international affairs. This we are not yet doing. The citizen on Main Street has no well founded opinions on international problems, to which he remains a complete stranger. His son on a foreign battlefield is widely reported to be consumed with one great desire—to get the job done and go back home.

Likewise, many utterances of government officials on foreign affairs can only be described as naïve. These include statements on our apparent intentions to dominate the world's air and sea traffic, to change the foreigners' ways of life, to throw the world open to unbridled competition, and to solve everybody else's social, racial, and colonial problems. The awakening from these childish dreams is not likely to whet the public appetite for international problems.

Thus, the editors believe that a resurgence of isolationism, a blind, primitive desire to return to "the good old days" and forget the confusing problems of international affairs, will take place in the short-range postwar world. One of the consequences will be a renewed clamor for tariff protection, probably with organized labor exercising its great political power to protect inflated wage scales by this expedient.

A survey of public opinion at the present time strongly suggests that the trend is toward lower tariffs and greater encouragement of international trade. Even a poll of the National Association of Manufacturers depicts a majority as favoring lower tariffs. However, we believe that the conditions which permitted isolationism for over a century are not as changed as people seem to assume while competition is suspended. When business men, labor leaders, and politicians are face to face with the actual facts of postwar competition, they will be more inclined to turn to tariff protection as a means of solving their immediate difficulties. They will certainly resist the dislocations which are bound to result from profound changes in tariff rates. In many cases such changes would demolish whole industries or cut entire communities adrift.

Moreover, in the wake of such an appalling orgy of destruction, the subsidization of national self sufficiency is certainly not going to be thrown overboard unless the public believes that a trustworthy international collective-security program has been developed. The most recent trends have been toward preserving the sovereignty of powerful nations. Thus, it is apparent that a genuine collective-security mechanism will not be functioning at the end of the war, and may take many years to build. In the meantime, the United States will undoubtedly cling to those remnants of self-sufficiency it still possesses, and may even strengthen its subsidies in some cases. This has already been officially forecast in the case of our merchant marine.

On the above premises we offer the opinion that for at least a few years after the war, operations which depend on tariff protection for their existence will not be as far out in the cold as the present state of public sentiment indicates.

Quota Systems Recommended

As long as the world remains dominantly nationalistic, to remain powerful we must assure our continued access to the raw materials needed by our vast industrial organization. We have abundant but dwindling resources. To prolong the utilization of domestic raw materials we must protect the industries which extract them from ruinous competition. When any given domestic suuply becomes inadequate, or the cost becomes onerous to processors and consumers, we must arrange to bolster the supply from foreign sources. In so doing we must assure a continued supply on reasonable terms under any possible conditions. However, sound policy dictates that the transition from the high to lower tariff rates thus indicated should be accomplished gradually to avoid painful dislocations.

We suggest that the only feasible way to meet such transition problems is through the development of workable quota systems. By such arrangements domestic producers can be protected as to portions of their markets without throttling all international trade or forcing the payment of burdensome toll on limited imports.

The general formula for such quota systems is to estimate how much total domestic market exists, then to decide how much should be filled from domestic sources. The decisions should take into account problems of capacity, production costs, price, consumer ability to pay, self-sufficiency, conservation, and substitution. The differences are then set up as import quotas, to be allowed to enter at reduced duty rates. For imports in excess of quota higher rates would be imposed, which in various cases might be graduated or prohibitive.

Many readers will assume that the establishment of quota systems involves regimentation, cartelization, or pioneering into untrodden ground. The fact is that quotas have been applied to certain commodities in several of the reciprocal trade agreements. Their feasibility is suggested by the inclusion of clauses in the more recent treaties providing rights to establish quotas.

Quota systems have the disadvantages of complicating tariff administration and increasing government par-

ticipation in industry's affairs. However, they provide an adjustable basis for compromise where high protection but increased imports are desirable. In fact, they constitute the only basis yet devised to meet such conditions besides direct subsidies to domestic producers. Subsidies would probably encounter furious political opposition as peacetime measures.

Currency Devaluation Probable

The producers of gold have a deep interest in that aspect of the inflation problem involving currency devaluation, as the same affects the price of gold.

The viewpoint of the editors is that some degree of currency devaluation is unavoidable sooner or later. The combined costs of prewar extravagance and the war will result in a tax burden too great to be borne by posterity alone. The reason we think is probable despite the number of the government's creditors is that retirement of the debt in conventional fashion will be likely to hamper the nation's productive mechanism. Inasmuch as most people have more at stake in jobs than in savings, we anticipate a popular trend in favor of devaluation as an expedient to permit the productive machinery to function efficiently. Throughout history, governments have resorted to devaluation when debts became burdensome.

Admittedly, a continued high level of national income will do much to make the government debt easier for taxpayers to bear. However, the optimists who see this as a complete answer seem to assume that the future holds nothing but perpetual prosperity. The debt will be with us for a long time to come, and we shall certainly outdo all reasonable expectations if we banish hard times forever from the earth.

The international aspects of this problem are particularly difficult to control. Foreign governments involved in the war have the same debt problems as ourselves. Also, most foreign nations are more dependent on foreign trade than ourselves. In the scramble for markets which will take place after the war, it seems as though the temptation to devalue currency to induce export trade will be insurmountable. There is no effective international organization to prevent each sovereign nation from taking a purely selfish course in this respect. If competitive devaluation occurs, the United States will be forced to follow suit, unless it is willing to face serious handicaps in export trade.

Wage Increases Will Be Partly Retained

Naturally, both employers and labor alike are uneasy over the problems that resumption of world competition will bring into focus. Our wage levels are boosted to unprecedented heights. The more populous low-living-standard countries, China and India, are preparing to industrialize themselves, Western-style, and thus be more competitive to our industries than has ever been the case in the past. Most of the high-living-standard countries have been so wrecked by the war that their peoples are likely to be more interested in simple survival than in the degree of affluence which they enjoy. Can we maintain our high living standards in the face of such competition? If not, will labor organizations cooperate with the rest of the public in finding economic solutions or will they resort to class warfare?

If and when such problems must be faced, those industries will be fortunate indeed whose managements and labor have developed a working basis for amicable solution of their common problems. Certainly, Americans have proven that no important group in a high-production economy can prosper at the expense of the rest, and that the depression of any important element pulls the roof in on the whole house. Nevertheless, there is a long way between acceptance of this principle while it is remote and costs nothing, and living up to it when the "going gets tough." No realistic survey of present labor-management relations today could return with the conclusion that the way is clear to peaceful, constructive settlements or that government incursions into labor relations have improved the situation.

In the mining industry, the evidence of an advanced position in this respect is certainly not overwhelming. Also, much potential strife has been averted by the government policy of giving labor substantially what it has demanded, then promising the victimized employers relief through price or premium benefits. Now that "the honeymoon is over" with respect to special efforts to increase production of many minerals, the industry will no doubt face more crucial problems in labor-management relations.

Although on the one hand it seems inevitable that real wages will necessarily decline after the war, on the other it can scarcely be assumed that they will sink to prewar levels; thus, in order to maintain production the industry will have to develop new sources of efficiency and may require higher average prices for its output.

Action on Taxes Recommended

Our judgment would merit little respect if we were to predict that there is any prospect whatsoever of returning to tax levels of the twenties, or even of the thirties. They who bemoaned the reckless spending of the thirties as ruinous may be shocked, but any reductions below double the highest prewar budget must be considered as gains to taxpayers that we dare not predict. Informed forecasts of postwar government finance indicate a federal budget of 25 to 30 billion dollars per year. Debt service alone will be larger than the total expenses of the federal government prior to the New Deal.

To mitigate this disturbing outlook there are a few factors tending to afford some solace. The anticipated higher level of national income, if achieved, will make such taxation easier to bear. A portion of the increases, such as pensions for the aged and social security insurance, will take the place of expenditures which taxpayers have been accustomed to make directly. Now that taxes reach more people, Congress is beginning to show an encouraging interest in government economy. If there is any comfort to the camel in knowing that it has reached a condition where the next straw will break its

back, normal corporate taxes have been raised to the point where nearly all authorities agree that higher rates will yield diminishing returns.

A feature of mine taxation which warrants close attention from the industry revolves about the subject of depletion. Allowances for depletion in the tax laws are based more or less on theories as to the past cost of replacing depleted reserves. It is commonly understood that in recent years the industry has not been finding new ore as rapidly as known ore has been exhausted. It also is perfectly apparent that the cost of finding ore in the future will be much greater, per ton of recoverable metal, than the acquisition cost of ore reserves now held and being mined. Therefore, it is entirely logical that the industry should bestir itself to secure more liberal allowances for depletion in the tax laws.

Another similar problem is the deferment of development expense due to wartime labor and material shortages (*E.&M.J.*, October, page 60). Unless the operator is to abandon his property, the development he is forced to suspend will have to be done at some time in the future; meanwhile, the accumulated funds, which should be regarded as a reserve, are taxed as profits at wartime rates. This is a situation not provided for in the law to date, which the mining industry should certainly take to Congress in force.

In addition to these special problems, it would be well for the industry to recognize its stake in more general tax issues. It is perfectly apparent that any amount of concern over the fate of private enterprise will be wasted if present taxes on industry are not greatly reduced after the war. It is inconceivable that private enterprise can survive, much less create full employment, if it is burdened with such taxes. There will undoubtedly be a move to retain excess profit taxes, which should be furiously resisted. Even the present normal corporate tax rate is a crippling load. The mining industry is deeply affected by high taxes on capital gains, which discourage much needed investment in the search for new mines. Thus, it is of fundamental importance that the industry should take a more whole-hearted interest in tax problems than has been shown in the past.

We Must Have Leadership

It would be possible to go on at great lengths about the crying need for more leadership in political circles. Had we more men in Washington qualified for leadership we might have avoided much of the endless confusion which has reigned over the home front during the war. We might not now be seeking new ways to temporize with inflation and tax problems. We might have been spared the humiliation of seeing our federal government cringe under the lash of a labor czar. For the first time in history, its supreme authority has been successfully flouted.

However, to go on thus would be unseemly, considering our own deficiencies. The need for industry leadership is just as necessary and lacking as in political circles. True, industry contains most of the country's able men, numbers of whom merit nothing but respect. Nevertheless, with few exceptions industry leaders are completely snowed under with the problems of their particular organizations. They do not have time to take up the general problems of their respective industries and to interpret them to the public and government. In this respect we are far behind the British, who expect successful industrialists to take part in public affairs. As a result, whereas in British circles the fundamental worth of industry is widely recognized, American industry is constantly on the defensive as a quasi public enemy. Had we more industry statesmen, it would be impossible for demagogues to find it profitable to heap abuse on industry.

Taking up the case of mining, how many leaders do we have to whom the public is accustomed to turn for answers on mineral industry issues? Who was ready to purge the industry of disrepute from the unfounded insinuations of the T.N.E.C. investigation or the more recent blasts of the Justice Department? It does little good for the truth to turn up unnoticed in the pages of some court record long after the public has lost interest in the issues at stake.

In the editors' opinion, intelligent self-interest demands that mining should have capable industry statesmen to deal with its public problems. Nothing could be more thoroughly beneficial to the stockholders of mining corporations than to depart from the present custom of tying top-flight executives down completely with internal functions.

We now face a period when for both political and economic reasons we must take more part in international affairs. Many international problems have important economic roots. Many of our mineral industries will be more deeply involved in foreign commerce than ever before. Certainly it is evident to all that we are poorly equipped industry-wise to cope with international mineral problems. Continuance of this situation can only result in politicians and diplomats making the decisions unassisted, with unfortunate consequences to both the country and the industry.

Future Outlook Warrants Confidence

In summation, the editors believe that inflation will be held within limits and the reconversion problem will be adequately met, clearing the way for a postwar boom. Mineral consumption is likely to remain at high levels. Although the long-range outlook points to lower tariffs, no drastic tariff reductions are anticipated. Quota systems are recommended to meet some mineral tariff problems. Government cannot be expected to retreat from industry's doorstep, but reasonably full employment may prevent further encroachment. In common with all industry, mining must expect higher wage levels than prevailed before the war. The industry is urged to take a more active part in tax affairs, particularly in regard to the special aspects relating to mines. Currency devaluation is anticipated. Lastly, *Engineering and Mining Journal* exhorts the industry to develop its outstanding executives into "industry statesmen" to fill a crying need for the future.

In the light of these beliefs, the editors think that mining can face the future with confidence.

Gray Eagle Copper—New California Producer

500-TON FLOTATION PLANT near tunnel portal concentrates Gray Eagle ore for shipment by aerial tramway to Thompson Creek. Crushing plant, mill, bunkhouse, cookhouse and offices are shown

JOHN B. HUTTL, *Associate Editor*

To THE ever-increasing war need for metals may be ascribed the organization and establishment as a producer of the Gray Eagle Copper Company, a subsidiary of Newmont Mining Corporation. The property lies in a remote section of Siskiyou County in the northern part of the State. It is the first copper development of importance in California for many years.

The mine has long been known as a promising copper prospect. Serious exploratory and development work, however, was not started until 1916, during World War I, when Mason Valley Mines Company acquired the property, and proceeded to equip it. When metal prices crumbled in 1919, operations were gradually reduced and finally suspended. During this period more than 3,000 ft. of exploratory headings were driven from No. 7 tunnel, the main opening; about 10,000 ft. of raising and lateral work was done, and different sections were extensively diamond-drilled. A substantial tonnage of good ore was blocked out, but the quantity was insufficient to justify operation.

Early in 1942, the mine was reopened by the Gray Eagle company. Active production started March 17, 1943. The copper produced is under contract to the Metals Reserve Company. Holdings comprise 32 claims, mostly patented, on a mountain on the east side of Indian Creek in the Happy Camp area. Elevation of No. 7 tunnel is 2,539 ft. The climate is typical of the mountain regions of northern California—rain and some snow during the winter and warm, dry summers. Water is plentiful throughout the year. The topography is rather rugged.

After the company had done the preliminary work of rehabilitation, No. 7 tunnel was extended, a three-compartment service raise driven and equipped, and ore extraction raises and laterals were established. A modern surface plant and a 500-ton mill were built. At the time of my visit early in May, a modern 3½-mile aerial tram terminating at Thompson Creek was nearing completion. This has facilitated shipment of concentrates to Yreka 85 miles away. The route is 20 miles shorter.

The country rock of the Gray Eagle area is a chlorite schist, probably sedimentary in origin. The orebody currently mined occurs as a bed (a pitch-

ing anticline) within a low-grade pyrite zone 50 to 100 ft. thick and dipping southeast at about 25 deg., resting between layers of the schist. The entire structure is complicated by numerous normal faults, some of the major ones cutting across the orebody in a northwest-southeast direction. Some of these dip north and others south.

A leached capping or gossan, containing no copper oxide, covers the sulphide orebody. Chalcopyrite is the principal copper mineral. The orebody is more or less elliptical in shape, with the western section as yet not well defined. In this area about 10 percent of the ore is secondarily enriched. The ore contains little gold, is medium hard, and drills and breaks easily.

As mentioned previously, the mine is opened by No. 7 tunnel, 8x9 ft. in cross-section. This is the main haulage level. From the tunnel extend four ore raises to four sublevels just under the orebody. The sublevels are at 50-ft. vertical intervals. Access to the ore zone is afforded by secondary raises driven from the sublevels at 60-ft. centers. The service raise contains a 6x5-ft. hoisting compartment, a 4x5-ft. waste pass, and a 3½x5-ft. manway. The single-deck cage in the hoisting compartment is actuated by a 60-hp. single-drum hoist installed on the haulage level or No. 7 tunnel. The loading chutes of the main ore raises are equipped with steel gates controlled by compressed air.

Blocked-out ore is mined by a system of longwall radial slicing starting at the top of the secondary raises, with the resultant triangular pillars being removed and the ground allowed to cave as stoping proceeds downward. A modified system of top slicing probably will be used in the thicker section of the ore zone. Timber consumption is almost negative, the back in the stopes being supported with stulls and head boards where necessary.

Drilling is done with 3-in. automatic feed drifters mounted on Fowler quick-adjusting bars (air-controlled), using 1⅛-in. round steel with detachable bits. In the raises, self-rotating stopers with 1-in. quarter-octagon steel and detachable bits are used. Blasting is done with 40-percent ammonia gelatin and ordinary cap and fuse. Several jackhammers are available for block-holing and other auxiliary work. Air for drilling is supplied through a 6-in: line with 4-in. branches. Water is pumped from the surface plant through 2-in. lines, there being little of it underground.

Ore broken in the stopes is scraped to the raises mentioned, and dropped by gravity to the sublevels, whence transfer scrapers convey it to the main ore raises serving the haulage level. The 42- and 48-in. scrapers used in the stopes are operated by 20- and 30-hp. double-drum, electric-driven slusher hoists. The 60-in. scrapers operating in the transfer drifts are powered by 50-hp. double-drum electric hoist units. All ore raises are covered with steel grizzlies made with 90-lb. rails, spaced 12 in. Plus 12-in. material is reduced by hand.

Haulage equipment consists of two 6-ton storage-battery locomotives and 80-cu.ft. Granby-type mine cars. Each ore train is made up of 12 cars. A crew consists of a motorman and a helper. Loading, transportation to the primary crushing plant (about 2,000 ft. distant), and return require about 15 min. A well-equipped battery-charging room is near the service raise station. Tracks on the haulage level are of 35-lb. rails, with closely spaced wooden sleepers.

Ventilation is natural. All workings are well lighted electrically, and no efforts are spared to provide healthy and safe working conditions.

★ ★ ★

COMING

in E. & M. J. for January

Postwar mining practice will have to be more efficient than ever to overcome the handicap of high costs for labor and supplies and of lower average grade of ore. Read the article by Mark A. Smith in next month's E. & M. J. It is No. 3 in the series, "Postwar Outlook for Mining."

Also in the January issue—"Ore Treatment in the Postwar Period" and "How Anaconda Trains Its Men."

★ ★ ★

Crushing plant and concentrator are near the portal of No. 7 tunnel. Both are of wood-frame construction, the outside of the walls being covered with heavy roofing paper and the roofs with corrugated iron sheets.

The flowsheet is shown opposite. The treatment follows closely that of the newer copper concentrators in Arizona. Crushing to mill feed size is done in three stages, followed by single-stage grinding and flotation, with thickening and filtering of the finished concentrates.

More explicitly, the minus 12-in. ore, hauled from the loading chutes in the mine in 80-cu.ft. Granby-type mine cars, is dumped into a wooden 600-ton coarse-ore bin at the head of the crushing plant. From this a vibrating feeder feeds it to a 24x36-in. primary jaw crusher set to give a minus 4-in. product. This material then is passed over a 3x6-ft. rod-deck screen discharging minus ⅜-in. and minus 1½-in. products. The former is a finished product. The latter is fed to a 4-ft. short-head cone crusher. Screen oversize goes to a 3-ft. standard cone crusher. Products from both cone crushers are delivered to a 4x8-ft. rod-deck screen. Oversize is returned to the short-head, while the undersize goes via a horizontal belt conveyor to a wooden 2,000-ton fine-ore bin. Here, distribution of the belt load is controlled by a hand-operated tripper.

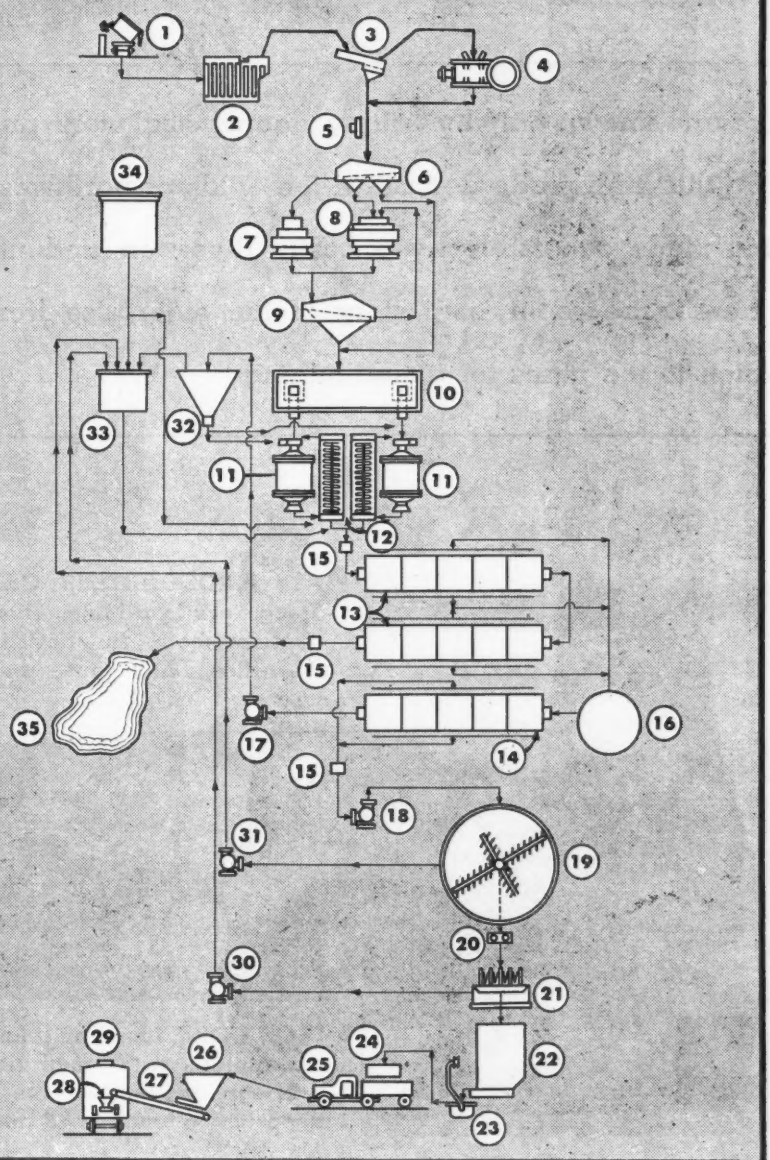
Grinding to about 90 percent minus 200 mesh is done in two 7x7-ft. ball mills charged with 3-in. steel balls and operating in closed circuit with 72-in. spiral classifiers. The flow of ore from the storage bin is controlled by two constant-weight feeders. Pulp overflows the classifiers at 20 to 25 percent solids.

Flotation is done in three banks of machines, each comprising five 56-in. level-type Fagergren cells. Two banks in series are employed as roughers, and the third as a cleaner. Concentrates produced by the rougher machines go to a 6x6-ft. conditioner before entering the cleaner, and the tailings flow through a 3-mile wooden flume to the tailings pond. Conditioned rougher concentrates go to the cleaner machine at 10 to 14 percent solids. Final concentrates are successively treated in a 35-ft. thickener and a 6-ft., five-leaf disc filter. Cleaner tailings are pumped to a 7-ft. Callow cone. The underflow is returned to the ball mills, and the overflow is used for pulp dilution.

Mill feed includes three types of ore: (1) material with free chalcopyrite; (2) ore containing chalcopyrite intimately associated with pyrite and (3) secondary enriched material from the western part of the mine. Milling in consequence necessitates close supervision. The second-named material requires fine grinding to effect a satisfactory separation of chalcopyrite from pyrite, while the third presents both physical and metallurgical difficulties because of sliming.

Owing to the short time the concentrator has been in operation, only a few metallurgical data can be given. Mill heads contain more than 4 percent copper. The ratio of concentration is 4 to 1. In the flotation section reagents 238, 242, Z-3, and Z-5 are used as promoters, and B-23 as a frother. About 1 lb. of lime per ton of ore treated is added to the conditioner, and 1½ lb. to the ball mills. The mills and conditioner also receive 0.025 lb.

FLOWSHEET OF GRAY EAGLE CONCENTRATOR



LEGEND

1. 80-cu.ft. Granby cars.
2. 600-ton coarse ore bin.
3. Allis-Chalmers Utah vibrating feeder, 3½x7 ft., plus 2 ft. grizzly section with 2-in. openings, 10 deg. slope.
4. 24x36-in. Traylor jaw crusher.
5. 37-in. Cutler-Hammer magnet.
6. 3x6-ft. Symons rod-deck screen.
7. 3-ft. standard Symons cone crusher.
8. 4-ft. short-head Symons cone crusher.
9. 4x8-ft. Symons rod-deck screen.
10. 2,000-ton fine-ore bin with two size "C" Hardinge constant weighing meters
11. Two No 77 Marcy ball mills.
12. Two 72-in Wemco spiral classifiers.
13. Two 5-cel. 56-in Fagergren roughers.
14. Five-cel. 56-in Fagergren cleaner
15. Geco automatic samplers
16. Denver 6x6-f. conditioner
17. 8-frame Hydroseal sand pump.
18. 2-in. Wemco sand pump.
19. 35x10-ft. type A Dorr thickener.
20. No. 2 Dorr duplex diaphragm pump.
21. 6-ft., 5-leaf Eimco disc filter.
22. 175-ton bin, 14-in. screw conveyor.
23. 10-cu.ft buckets of 3.4-mile aerial tramway.
24. Individual 10-ton concentrate bins
25. 10-ton trailer trucks.
26. 65-ton bin loading station
27. Shuttle conveyor
28. S-A normal duty piler.
29. Railroad box car.
30. Centrifugal pump.
31. Centrifugal pump.
32. 7-ft. Callow dewatering cone.
33. Constant level tank.
34. 100,000-gal. water tank.
35. Tailings pond

and 0.05 lb. respectively of sodium cyanide. A pH of 9 to 9½ is maintained in the rougher circuit, and 10 to 11½ in the cleaner.

The finished concentrates contain about 9½ percent moisture. They are discharged into a 175-ton bin equipped with a 14-in. screw conveyor to load the 1-cu.ft. buckets on the aerial tramway. The loaded buckets are weighed and sampled before being sent to the terminal at Thompson Creek 3.4 miles away, where the contents are discharged into individual bins, each holding 10 tons or a truck load.

Trucking to Yreka, the railroad shipping point, is done by a fleet of seven semi-trailer units. Because of weight restrictions on the bridges, the tare weights of the trucks were held as low as possible, and the units were not equipped with hydraulic lifts. At Yreka, the trucks are dumped by an electric hoist into a 65-ton storage bin served by an 18-in. shuttle conveyor belt mounted on an inclined track. After an empty railroad box car has been spotted, this conveyor is positioned so that the belt discharges into the hopper of a box car loader which can be directed to throw the concentrate into any part of the car at a rate of 40 to 50 tons per hour. Loaded cars are sent to Tacoma.

Water for plant operation is obtained from Luther Creek through an 8-in. pipe line. Electric power is furnished by the California Oregon Power Company. At the tailings disposal site, 3 miles distant, provision has been made to assure a clear overflow.

Surface plant structures installed around the portal of No. 7 tunnel include a machine and blacksmith shop, a detachable bit reconditioning shop, a modern change house, a warehouse, and a compressor house containing a 2,060-c.f.m. unit, driven by a 350-hp. synchronous motor, and a 1,000-c.f.m. unit driven by a 175-hp. synchronous motor.

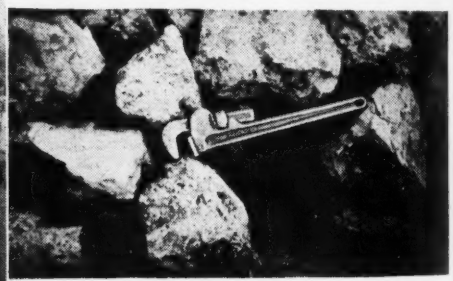
A new hotel for single men, restaurant, and general office are situated a short distance from the concentrator. Dwellings for staff members have been provided.

I am indebted to Robert J. Hendricks, manager, and W. P. Goss, assistant manager, for the hospitality shown me during my recent visit and for the data presented here. Other members of the staff are Duncan L. King, mill superintendent, H. J. Steele, mining engineer, W. E. Meals, in charge of plant design, Jack Widauf, mine foreman, E. H. Tucker, chief electrician, Howard Johnston, master mechanic, and F. A. Scheck, chief clerk and purchasing agent.

PROGRESS AT STEEP ROCK

Concealed by a lake and known only by drilling, geophysical work, and the presence of float, this high-grade deposit in the wilds of northwestern Ontario is being made accessible by a costly diversion and unwatering scheme. Here is the step-by-step story of the enterprise from the start of exploration to the plans for actual mining

AT HEADQUARTERS CAMP of Steep Rock Iron Mines Limited on the lake shore. Buildings include the office, bunk house and commissary



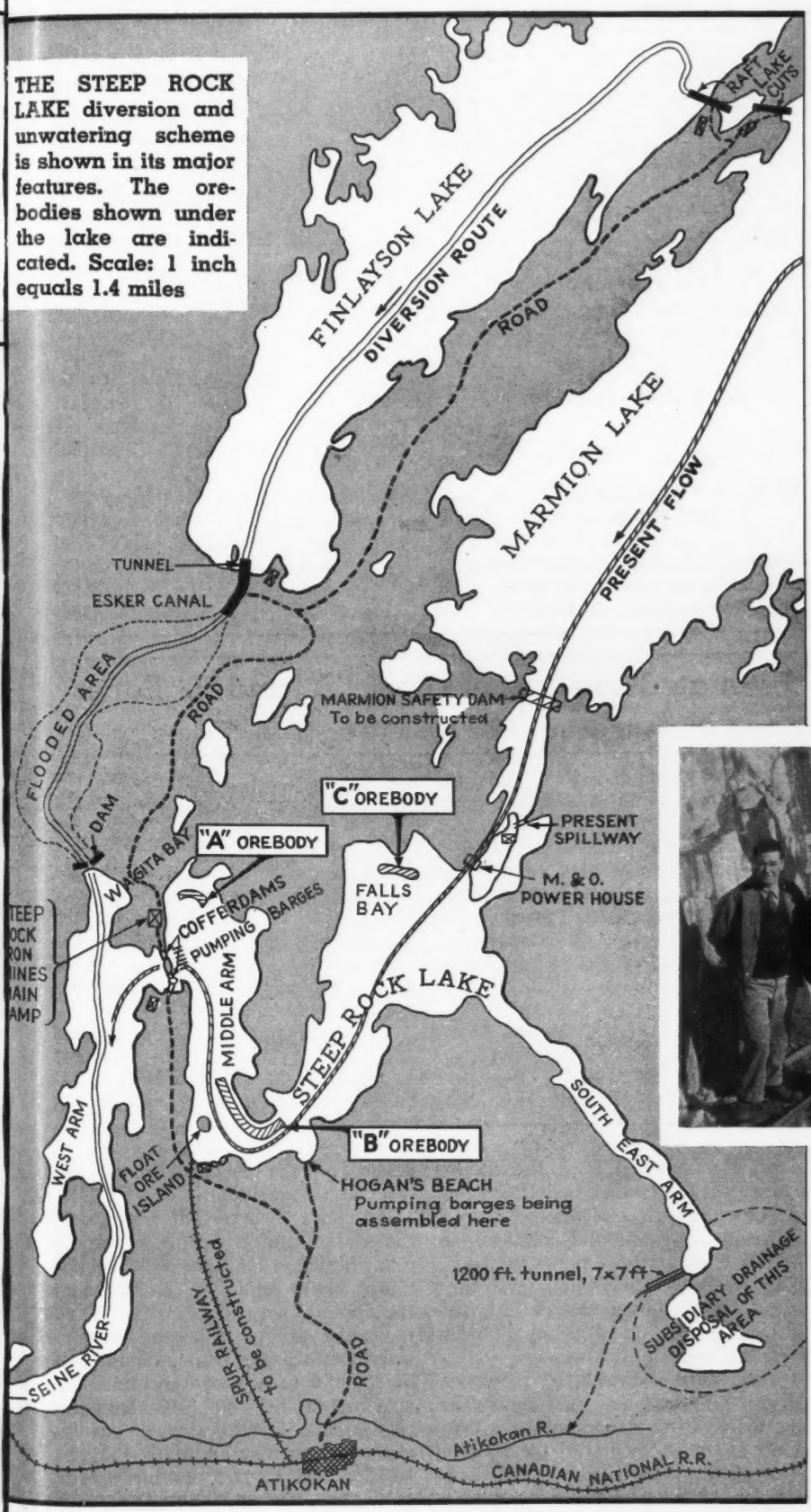
FLOAT ORE, found on lake shore, constitutes, with the diamond-drill core, evidence of the hidden deposit. (Wrench is 18 in. long)

ENGINEERING PRELIMINARIES of a sort not often required in a mining undertaking, coupled with other unusual circumstances attendant upon a successful search for a rich ore deposit, the existence of which has been long suspected, have won wide attention for the enterprise that Steep Rock Iron Mines Limited has under way in the wilderness of the Rainy River district in western Ontario. Rarely is it necessary to shift a river's course and to empty a large lake before one can start mining an orebody. Equally unusual is it to spend huge sums of money on a mining project before a face of ore or even an outcrop has been seen. These are among the interesting aspects of this venture.

A surprising circumstance is that, despite the long known existence of float fragments of high-grade iron ore, a persistent hunt for the orebody and its discovery were so long delayed. The region is not remote. Less than three miles south of the deposit is Atikokan, a station on the Port Arthur-Winnipeg line of the Canadian National Railways. At the point, moreover, where the Seine River enters Steep Rock Lake, from which the enterprise takes its name, is a 10,500-hp. plant of the Ontario-Minnesota Paper Co. Prospectors, lumbermen, commercial fishermen and others with lesser objects in life have long traversed this region of woods and lakes. To those looking for ore the float unquestionably suggested the presence of a deposit nearby. A map of the Geological Survey of Canada, issued in 1897, had mentioned this possibility, after which considerable ground was staked in the area but in only one instance on the lake. Attention to the land under the lake brought success in 1938 to Julian G. Cross, mining engineer, and the late Joseph Errington, successful promoter, who backed Cross after he had exhausted his funds. Eventually, in 1939, the Steep Rock company was organized, with Mr. Errington as president, and Mr. Cross and Maj.-Gen. D. M. Hogarth as directors.

The new bonanza, as yet hidden beneath the waters of Steep Rock Lake, represents Canada's premier discovery of iron to date. It is a national asset. The iron it contains is an important addition to the Dominion's previously scanty reserves. Estimates of ore for those portions of the zones

—Canada's Iron Ore Bonanza



that have been extensively developed by churn drill holes have been prepared by Messrs. Roberts and Crago, consultants; at June 1, 1943, they showed about 31,500,000 tons of "proven and probable" ore, composed of a mixture of red and brown hematite averaging, in a composite sample, 60.8 percent iron by dry analysis. The impurities are very low, phosphorus being 0.017 percent, silica 3.37 percent, and sulphur 0.039 percent. The physical structure is said to be such as to warrant the expectation that at least a quarter of the output will be very desirable lump ore.

With this Steep Rock reserve Canada now has a greater share in the mineral wealth of the Lake Superior region. The Iron Country is now definitely stamped as international, geographically, more so than with the Michipicoten ores alone. Its boundaries have been extended to the north, still falling within the area of Pre-Cambrian rocks which have been so productive of base and precious metals and are promising for the future.

Today Steep Rock Iron Mines is

AT ESKER TUNNEL PORTAL—Col. G. G. Blackstock, R. J. Moore, and M. S. Fotheringham in center. At right, W. Samuel. At left, Alec Judson

headed by Cyrus S. Eaton, chairman of the board, and Maj. Gen. Hogarth, who succeeded Mr. Errington as president on the latter's death last year. Col. G. G. Blackstock is executive vice president. Consultants for the company are Hugh M. Roberts and Wm. H. Crago, of Duluth. At the property, in charge

of operations, is M. S. Fotheringham, general superintendent.

The enterprise has ample funds. A sale of debentures yielded $2,000,000 (U.S. currency) in 1942-43. In addition the Reconstruction Finance Corporation, across the border, has loaned the company $5,000,000 which it has only recently begun to draw upon. This is the biggest mining loan that the Corporation has ever made. Supervising engineer for the R.F.C. at the property is R. J. Moore who is located at the property for the purpose of supervising and approving operations and expenditures.

Company holdings cover most of the waters of Steep Rock Lake and much of the land bordering upon it. Acquired by staking or purchase, they comprise 7,500 acres in 174 claims. Of these all but 13 are patented.

Probing for the Unknown

In accumulating the mass of facts now available about the ore beneath the lake, full use has been made by the company of geological and geophysical surveys and of exploration drilling. Each of these has aided in understanding the other.

On the accompanying map is shown the general geology of the area. Granite, the oldest rock in the basin, is confined to the north and east shores of Steep Rock Lake. Overlying the granite successively are clastic sediments, limestone and volcanic rocks. These were subsequently folded and tilted, finally assuming a dip of 75 to 80 deg. south. The limestone is brecciated along its unconformable contact with the younger overlying tuffaceous greenstone and ashrock. A few small acid and basic dikes cut the sediments and volcanics.

The Steep Rock orebodies found by drilling occur along, or close to, the brecciated limestone-greenstone contact. To date exploration has not disclosed any concentration of iron ore distant from the limestone. The deposits are attributed in origin to hydrothermal replacement. The replacement solutions came in as igneous after-effects following the invasion of basic igneous rocks.

The ore itself, as seen in the drill cores and the float, is described by Messrs. Roberts and Bartley as an intimate mixture of hard dense red hematite and brown hematite (goethite). It is shot through with vugs ranging from minute size up to ½ in. in diameter and occasionally much larger. The ore drilled thus far occurs mostly as a replaced and cemented breccia, the component angular fragments varying from ½ to ¾ in. on a side. This breccia is commonly found along the footwalls of the ore zones, in contact with brecciated limestone. The hanging walls of these zones are greenstone, in which lenses of ore of a more massive character may occur.

In exploring the lake bottom, 250 closely-spaced "scout" diamond-drill holes were drilled vertically through the ice about 15 ft. into the ledge. They were spotted with the aid of geophysical work, to determine contacts and to locate and delineate the ore-zones in plan. In addition, eight angle holes, drilled from the shores and from underground, penetrated the orebodies at various locations.

To prove grade and tonnage, as well as shape of the deposits the combination of churn drilling and diamond drilling used on the Mesabi was employed. In all 83 such holes were drilled.

Thus were disclosed the three ore zones "A," "B," and "C" shown on the map. First to be found, the "A" zone, at the north end of the Middle Arm of the lake, is at least 3,500 ft. long and 175 ft. wide. Starting at a fault it runs for this length, beyond which to the south it has not been explored.

At the south end of the same arm is the "B" zone, at least 125 ft. wide and 4,800 ft. long, with both ends still to be investigated further.

Little work has been done on the "C" zone. Six scout holes have penetrated the ore and indicate horizontal dimensions of at least 1,000 ft. by 200 ft.

To this may be added that intersections of high-grade ore were obtained in the angle diamond-drill holes at vertical depths of 450, 700, 1,200 and 1,400 ft. The portions of the "A" and "B" zones for which ore reserves are quoted have been blocked out by churn drilling to 700 ft. below the present lake surface.

By the drilling data and samples thus obtained the estimated total of 31,580,086 tons of proven and probable ore in "A" and "B" zones was calculated. To the average analysis already given may be added that the ignition loss is 8.04 percent. With

(*Text continued on page 90*)

Exploratory and Development Drilling

STEEP ROCK IRON MINES LTD. — JANUARY 1938 TO DATE

	Feet
Exploratory diamond drilling	
Surface, 299 holes	100,558
Underground, 6 holes	2,439
	102,997
Development churn drilling	
Surface, 74 holes	27,797
Diamond drilling for diversion soundings	
Finlayson moraine, 39 holes	3,406
Narrows dams, 107 holes	4,559

Estimated Ore in Steep Rock "A" and "B" Zones

As at June 1, 1943

		Long Tons
Open Pit Ore	Proven	16,168,091
	Probable	10,584,792
		26,752,883
Underground Ore	Proven	1,075,989
	Probable	3,751,214
		4,827,203
Total Ore	Proven	17,244,080
	Probable	14,336,006
		31,580,086

Construction and Excavation Work at Steep Rock Property

1. Construction of 20 miles of road starting at Atikokan station and running to the various work camps, nine in number, operated by the company, including the headquarters camp on Midas Peninsula, (near the Narrows of Steep Rock Lake.) This road had to be surfaced with gravel borrowed from pits up to 6 miles distant. It is impossible to dig without striking bedrock. Two pile-bent timber bridges at the Narrows also had to be built; one 450-ft. bridge, the other 200 ft. long; both strong enough to carry 75-ton loads.

2. Construction of permanent buildings at the main camp.

3. Unwatering of Raft Lake. The volume pumped out totaled 550,000,000 U.S. gal. Seven 6-in. and two 8-in. pumps on rafts were used. The level of Raft Lake was 2 ft. higher than that of Finlayson Lake, and 35 ft. higher than Marmion Lake.

4. Excavation of cuts connecting Raft Lake with Marmion and Finlayson Lakes. This involved the excavation of 250,000 cu.yd. of rock in the cut on the Marmion Lake side and 300,000 cu.yd. of rock in the cut (see illustration above) on the other side. The cuts are 100 ft. wide, 0 to 95 ft. deep, and total 4,000 ft. in length.

5. Construction of a spillway 1,000 ft. long to hold the waters of Marmion Lake at their present level. This involved the excavation of 30,000 cu.yd. of rock and the placing of 4,000 cu.yd. of concrete. Control works have also been required, to let water out in the dry season to take care of power plants below the diversion area.

6. Construction of a 10x12-ft. tunnel 1,200 ft. long in rock connecting Finlayson Lake with Esker cut, with a concrete and steel discharge gate. This tunnel was driven in order to lower Finlayson Lake about 50 ft., thus permitting the excavation of the new diversion channels to suitable grade, and was designed for an initial capacity of 2,500 sec.ft. This unusual project lowered the lake at slightly better than the anticipated rate of 6 in. per day.

7. Excavation of the Esker cut (see below), involving removal of 1,200,000 cu.yd. of earth with some boulders; also 60,000 cu.yd. of rock.

moisture estimated at 7.0 percent, the "natural" iron content is found to be 56.54 percent iron, compared with 60.8 percent on the dry basis.

Steep Rock ore, in the opinion of Messrs. Roberts and Bartley and others, has been formed by replacement by hydrothermal solutions, as already stated. This explains many of the phenomena noted and leads these geologists to conclude that there may be a greater vertical range of hematite of the same composition than might otherwise be expected.

In addition to the three ore zones there are several other areas where the geologic succession of the known zones is repeated, offering the possibility of further occurrences. Among these areas are the north end of the West Arm of the lake and several places throughout the Southeast arm.

AT WAGITA BAY the diverted water enters the West Arm of Steep Rock Lake and thus finds its way into the region's drainage system

Diverting the Seine River

Until the recent completion of the diversion scheme the Seine River entered the northeast part of the lake in the Falls Bay area. Through its channel the waters of Marmion Lake found their way into Steep Rock Lake. On the accompanying map is plotted the course by which these waters have been diverted north and west and finally south into the West Arm of Steep Rock Lake at Wagita Bay. The West Arm is not to be unwatered but will be dammed off from the rest of Steep Rock Lake by cofferdams built between Midas Peninsula on the north and the islands and mainland immediately south.

The diverted flow of the Seine River now runs from Marmion Lake, through the Raft Lake canals, and into Finlayson Lake which now stands some 50 ft. below its former elevation. From Finlayson Lake the waters pass through the Esker Canal and thence through a natural creek system 4 miles long, re-entering Steep Rock Lake at the north end of the West Arm. It will be feasible, if so desired, to extend the diversion to the southwest to completely by-pass Steep Rock Lake and thus de-water the West Arm for possible future mining.

Marmion Lake is a reservoir required for power purposes and could not be drained. Its surface is 30 ft. higher than the level to be maintained in the channel through the bed of former Raft Lake.

The excavation of the Raft Lake cuts has offered an interesting comparison of churn drilling in the east cut with diamond drilling in the west cut. Patrick Harrison, mining contractor (who also drove the Finlayson drainage tunnel), first drove a 7x7-ft. tunnel the length of the cut on the bottom. From this he drilled horizontal holes 46 ft. long sideways to the walls. From the top surface, vertical holes were drilled to the bottom, spaced at 10 ft. intervals in rows 6 ft. apart at right angles to the length. The holes on each side were spaced 3 ft. apart along the edge. All holes were 1½-in. diameter and loaded with 75 percent Forcite. Two rows, or a section 12 ft. thick and the height and width of the cut, would be blasted at one time. Walls and bottom are remarkably uniform. In all 5,000 holes were diamond-drilled, totaling 250,000 ft. Drilling speed, including setups, averaged better than 10 ft. per hour.

The east cut, similar in dimensions and rock, was drilled with Keystone drills and 7-in. holes, spaced 20 ft. apart each way. A cost comparison of the two kinds of drilling is not possible at this time.

Five organizations have handled the diversion program. C. A. Pitts, of Toronto, did most of the excavation and concrete work. Patrick Harrison drove the tunnels and did some of the power line work. Boyles Bros. did the diamond drilling. Land has been cleared by a fourth contractor. The Steep Rock organization has directed all current operations and plant expansion, preparing for pumping and production.

Of the equipment required, Steep Rock has had three shovels with 2½-cu.yd. dippers and 11 quarry trucks, 8 of them 15-cu.yd. Euclids, 6 Keystone drills and a bulldozer. The contractors have supplied all the rest.

Steep Rock pays all the bills, the RFC engineer first approving them if the Government loan is involved.

The work of the diversion program described has been handled with a force of 950 men. Of this only the Steep Rock organization has been permanent. The company will require about 200 men to conduct the pumping and other preparatory operations over the winter. It is expected that the remainder of the personnel required for the diversion work will be engaged in construction of the railroad spur, ore docks, and similar tasks. Difficulty is experienced in getting good men and in sufficient numbers. High priority is enjoyed for both men and supplies but, as the management puts it, so far as the former are concerned the priority is just a hunting license.

Wages range from 45c. to $1.25 per hour, depending on the type of work, and to all wages is added a "cost-of-living" bonus ranging from 60c. to $4.25 per week.

Plans for Mining

Having completed the exploration drilling program and the task of diverting the waters of the Seine River that have been flowing into Steep Rock Lake, the company is now looking ahead to mining and hopes to be in production in August, 1944. Between it and this goal lies the task of pumping out the lake, all save the West Arm which is to be dammed off from the rest of the bed. The three ore zones lie beneath the portion that is to be unwatered and, if in the end they prove to be more or less continuous, so much the better, although there is some doubt as to this.

Present depth of water over the "A" zone ranges from 120 to 160 ft. with 60 to 235 ft. of overburden beneath it. The "B" zone lies under

CYRUS S. EATON, next to Mr. Fotheringham, and M. D. Thompson (C. N. Ry.), Hugh M. Roberts, Julian G. Cross, and W. H. Crago

50 to 180 ft. of water and 40 to 310 ft. of overburden. The water is deeper over the "C" zone where the depth varies from 210 to 265 ft. The lake depth averages 150 ft. and is greatest at the northwest corner near the power house where a sounding of 298 ft. has been obtained.

The total volume of water to be pumped out measures 118,000,000,000 U.S. gal. Plans call for pumping the entire area that is to be unwatered, down 110 ft. first. After this, attention will be concentrated on the Mid-West arm, under which lie the "A" and "B" zones, until it is empty. It will then be kept so, while the eastern portion of the lake is lowered another 100 ft. to a total depth of 225 ft. below its original level, at which point the water will be maintained.

For this portion of the program 14 Ingersoll-Rand 24-in. single-stage centrifugal pumps, each pump powered by a 500-hp. motor, were installed in November, 1943. Twelve will have induction motors and the other two synchronous units. Each pump will have a capacity of 23,000 g.p.m. against 65 ft. head with a maximum head of 125 ft. They will work in parallel to a head of about 110 ft. and two will be hooked together in series for heads up to 220 ft. Each of the seven pairs will be mounted on its own steel scow. With these in service, it is estimated, the lake level will drop 0.5 ft. per day.

One result of the diversion and unwatering program will be to put out of commission the 10,500-hp. power plant of the Ontario-Minnesota Paper Co., previously mentioned. This plant has been generating 60-cycle current at 6,600 volts and stepping it up to 110,000 volts. The government-owned Ontario Hydro Electric Power Commission will now convert it into a primary substation, in which to step down power which they will bring from Port Arthur over a newly constructed line costing $1,000,000. So far as possible, use will be made of existing equipment. The Steep Rock company will take power at 6,600 volts and step it up to 44,000 volts for local distribution. After pumping is completed, mine operation will require about 3,000 hp. only.

Ore will be exposed on the "B" zone first as the lake level falls. Mining will be started here, with standard open-pit methods, when the water has fallen 90 ft. Stripping by hydraulic means is under consideration, utilizing gravity flow for disposing of the material as far as possible and using pumps below this grade.

Blasting will be done in a way that will give the maximum possible quantity of lump ore with least fines.

Initially, diesel shovels of 2¼-cu.yd. capacity will load 15-ton Euclid trucks which will haul the ore over the lake bottom to a crusher station at the south end of the Mid-West Arm, on the shore immediately west of Float Ore Island. A grizzly will be used over the crusher to avoid unnecessary crushing of lumps. Three products are planned—one ranging from 12 in. to 3 in. in size, another of 3 in. down to 1 in., and fines. The ore, after crushing, will be elevated by an inclined belt conveyor to a point 65 ft. above present lake level for loading.

Along the hanging wall side of the ore zone, in isolated sections in the volcanics where oxidation was not so complete, certain small areas of ore high in sulphur are known to occur. Such ores will be segregated and will form a very small part of the total tonnage. Sintered, it should yield a desirable product high in iron.

When Production Starts

The production objective is 500,000 tons in 1944, and an average of 2,000,000 tons per year over the first 10 years. The ore will be reaching the market at a fortuitous time, assuming that the demand for steel and the present shortage of scrap continue. Normally, in open-hearth practice equal quantities of scrap and pig iron are used, such a charge taking 140 lb. of lump ore per ton of steel. Under current conditions the furnaces have been using a charge containing 70 percent of pig iron necessitating use of 450 lb. of lump ore per ton.

To handle Steep Rock ore between mine and lake boat the Canadian National Railways will construct a 3-mile spur between the loading station at the mine and Atikokan situated on their existing line to Port Arthur. The total haul to the latter point will be 144 miles. At Port Arthur the railroad will also build the necessary docks. These facilities are to be ready next July, for handling production starting Aug. 1.

A freight rate to the docks of $1.12 per long ton has been agreed upon. The Dominion Government is subsidizing the railroad to the extent of 20 cents a ton on the first 5,000 tons, after which the rate will be subject to renegotiation. A Lake shipping rate, not yet established, is anticipated that will presumably not exceed that prevailing between Two Harbors or Duluth and the Lower Lake Ports.

In conclusion, there is every reason to anticipate that such a superior ore as Steep Rock Iron Mines is expected to produce, can command a liberal premium on the market. Its indicated extraordinary quality should permit it moreover to be shipped further than ordinary grades and, in any case, give it an excellent position in a competitive market. It would appear therefore that, barring the unforeseen, the company's future is well assured.

Thanks are due the company for permission to visit the Steep Rock property, late in September, and for its hospitality while there. The information here presented was obtained largely through Mr. Fotheringham, general superintendent. Supplementary facts and opinion as to the geology and drilling have also been drawn from the already published paper of Messrs. Roberts and Bartley. Mr. Moore, R.F.C. engineer, kindly guided the writer about the construction camps at the time of the visit.

Efficient Work Schedules For the 40-Hour Week

TELL ERTL, *Assistant Professor of Mining Engineering, University of Kansas, Lawrence, Kan.*

CONDITIONS OF WORK in underground metal mines are decidedly different from those in factories and in surface mines. For instance, most underground work consists of drilling, mucking, timbering, and blasting (76 percent, according to a survey by the United States Department of Labor). In those mines where the faces are blasted at the end of the work shift, the men of the following shift cannot in most cases enter the stope or working place for at least an hour after the first shift leaves the mine.

In metal mines the work day is almost universally eight hours long. According to the ruling by General Philip B. Fleming, administrator of the Wage and Hour Division of the United States Department of Labor, effective on May 1, 1941, working time of metal miners must be calculated from the time they begin the shift at or near the portal or collar of the mine until they again arrive at the portal or collar after the shift is over. During the lunch period, which is generally half an hour, the miner is underground on his own time. Consequently, he spends eight and one-half hours underground each day. Because of the time required for exhaustion of the powder gases at the end of each underground shift, the elapsed period between the beginning of successive shifts is at least nine and one-half hours. Therefore, a mine where these conditions obtain cannot be operated three standard shifts per day.

It is pertinent to inquire, then, whether or not a mine could operate on three six-hour or seven-hour shifts per day. Perhaps some mines could, but there are others where men spend as much as two hours per shift en route to and from the mine faces. These men spend eight hours per day on company time underground, but only six hours per day in their working places. If the day were cut to six hours (company time) such men would be at the faces four hours each shift.

Moreover, most underground time is consumed in breaking the "round" or completing a cycle. In most mines this cycle must be finished during each shift so that the ore may be extracted profitably, but the cycle can seldom be finished in less than six hours at the face. If the "collar-to-collar" day were cut shorter—below eight hours—the completion of the cycle would in most cases be impossible. If the cycle were not completed during the shift in which it started, the round would not be ready to fire until early in the following shift. In those mines in which it is permissible to blast during the day, the men would be compelled to lose one or more hours while the powder gases cleared from the stope. In most mines, however, it is feasible to blast only at the close of the shift. Because a new cycle could not be instituted until the old round were blasted, the men would spend the remainder of the day in idleness, and two six-hour "collar-to-collar" shifts would be required to finish the amount of work now done in one eight hours in length. Hence, it can be seen that the six-hour or seven-hour day is impractical.

Length of the operating week must also be considered. Underground mines operate most efficiently and profitably on a seven-day per week schedule. A few of the reasons for this are that pumping, ventilation, maintenance, and some repair must go on continuously. Also, the rate of depreciation of extraction openings, machinery, track, piping, etc., is largely a function of both time and use. Interest, depreciation, and obsolescence continue as charges on capital equipment whether the latter is in use or not. Inasmuch as each face in operation ties up capital and increases costs that are dependent on time, a mine should operate as few working places as possible. Hence, for maximum efficiency, a mine should operate seven days per week with two complete mining shifts each day.

Some of the systems that have been employed for the operation of mines under the 40-hour week staggered the work days of each man in the crew. Consequently most men were off two non-consecutive days each week. In such a case the miners would rather lay off two days at a time.

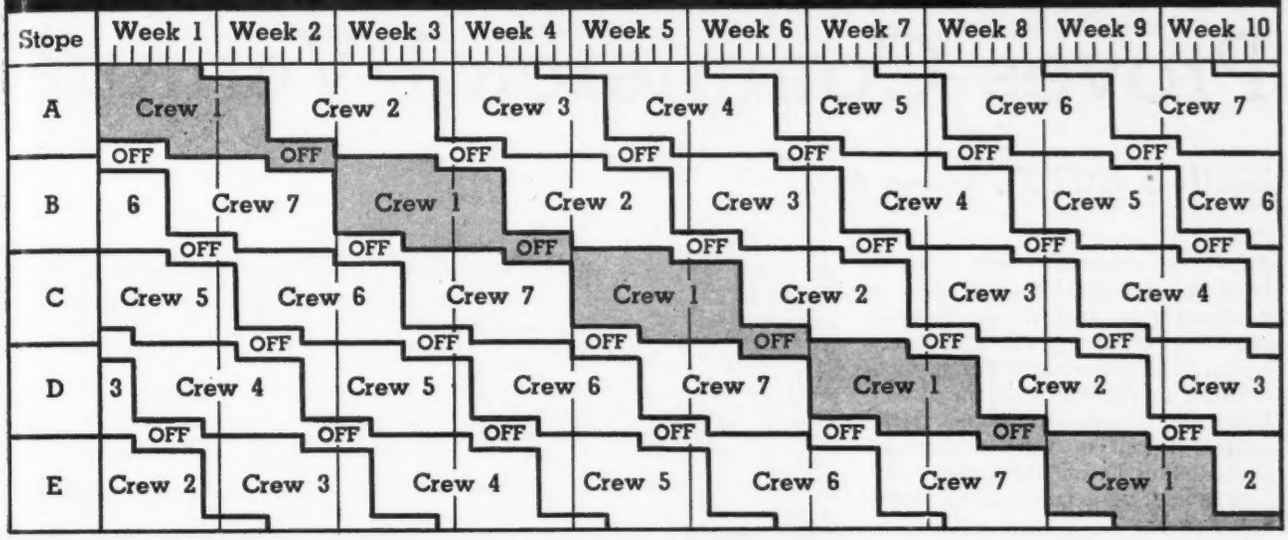
With all of the above points in view, I suggest a new method for administering working time in underground metal mines, which will conform to the requirements of both efficient management and the Fair Labor Standards Act, and which will also be agreeable to the labor force.

If mine crews consisted of five men, the administration of their time would be simple. In situations where operation seven days per week is desirable,

Commonly Used "Swing-Shift" Arrangement

Man No.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
1						OFF	OFF
2	OFF						OFF
3	OFF	OFF					
4		OFF	OFF				
5			OFF	OFF			
6				OFF	OFF		
7					OFF	OFF	

Schedule for Rotating Seven Crews Through Five Working Places



SEVEN CREWS, each working ten consecutive days and having four consecutive days off in each two-weeks' period, can be handled thus in area having requisite stopes. Two crews will always be off

seven men could operate as a unit; two of the seven would be off each day while the other five reported at their working place. Each man would then work only five days per week, and the working place would be operated seven days per week, as shown in the tabulation opposite, which shows a "swing-shift" arrangement often used.

The system illustrated could readily be applied to the maintenance crews, the motor crews, track crews, and other crews in which each man can do any of the necessary work. However, only a small portion of the labor force could be formed into five-man crews. Most work in underground metal mines requires crews consisting generally of two men, often three men, and only occasionally four.

The plan outlined in the next few paragraphs fits the condition of a mine which operates seven days per week and where the labor force conforms to the law and works but five days per week. With a little modification this plan can be adapted to meet the demands of mines operating six or seven days per week while the miners work five and one-half or six days per week. Each crew will always mine together as a unit, whether it consists of two, three, or four men. A crew will always work opposite the same crew and will change shifts every two weeks. The men will work 40 hours a week, but two weeks will be worked "back-to-back" so that each crew will work ten consecutive days and lay off four days. A crew will always begin its ten-day stretch on the same day of the week. The crew will always report to the same boss, and mine in the same region, under similar conditions. However the crew will work in one of five stopes or faces. Seven crews will mine these five stopes. Each stope will operate seven days per week, each machine will operate seven days per week, and the mine will operate seven days but the men will work only five days or 40 hours. The chart shows how this arrangement will operate.

Crew 1 will report in Stope A on Monday morning and, if the stope is operating two shifts per day, Crew 1′, which always is on the opposite shift, will report in Stope A on Monday evening. These crews will work in Stope A for ten consecutive days. After four days of lay-off, Crew 1 will report on Monday evening of the third week in Stope B and work there ten consecutive days. At the beginning of the fifth week, Crew 1 will report back on day shift but now in Stope C. Crew 1 will begin on the night shift in Stope D in the seventh week, on the day shift in Stope E in the ninth week, and finally in the eleventh week, back to Stope A.

Crew 2 and the men on the opposite shift, Crew 2′, will always follow Crew 1 and Crew 1′ into every stope. Consequently, Crew 2 will always begin their week on Thursday and work ten consecutive days from Thursday through the second Saturday following. Crew 3 and Crew 3′ will always follow Crew 2 and Crew 2′ into every stope. They will start work on Sunday and work through until the second Tuesday following. Crew 4 follows Crew 3; Crew 5 follows Crew 4; Crew 6 follows Crew 5; Crew 7 follows Crew 6; and finally Crew 1 will begin the cycle anew by following Crew 7. Inasmuch as there are seven crews and each one works ten consecutive days, and the stope operates seven days per week, then the seven crews work 70 days or ten weeks in a stope before the first crew again enters that stope.

The arrangement of working time described above meets all the requirements for an efficient operation and at the same time does not require the operator to pay the overtime penalty for miners working beyond the 40-hour week. A private communication from an attorney for the Department of Labor elicits the information that this arrangement of working time transgresses neither the Fair Labor Standards Act nor any of the administrative interpretations thereof. Under this plan the mine can be operated a maximum number of shifts per week with a maximum production of ore from a minimum number of faces and with a minimum amount of capital expenditure. The plan does not alter the operation of the present routine, the double shift, the change of shifts, the working day, or any of the other factors which through long usage have been established as the most efficient method of operating underground mines.

Such a plan should be well received by the employees because, instead of having one day off every three and one-half days, as in some stagger systems, or two consecutive days per week as in most systems, the men will get four consecutive days off every two weeks. I feel certain that the adoption of such a plan will result in reduced costs and increased efficiency.

Spud Patch Tungsten Placer Proves Commercial Venture

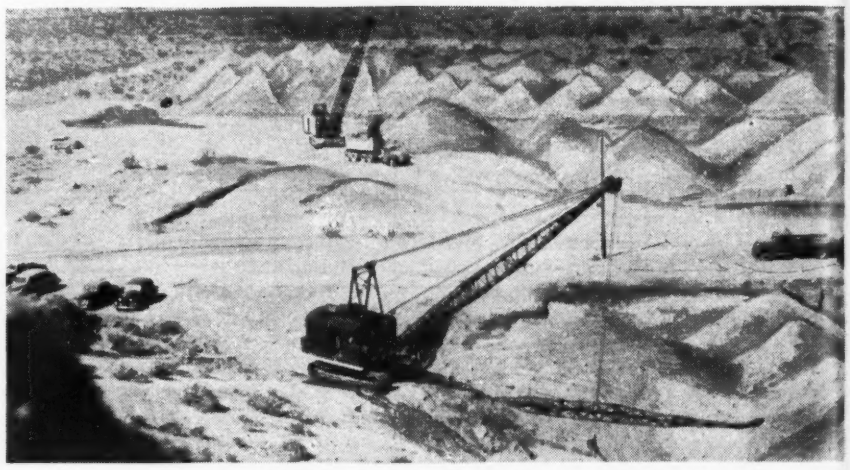
JOHN B. HUTTL, *Associate Editor*

ALTHOUGH SCHEELITE often is found in alluvial material, especially where it is derived from a tungsten-bearing area, alluvial scheelite deposits have rarely proved to be commercial. An exception is found in the Atolia region of San Bernardino County, California. Here such a deposit is being successfully worked, thus having more than ordinary interest. It is known as the Spud Patch placer.

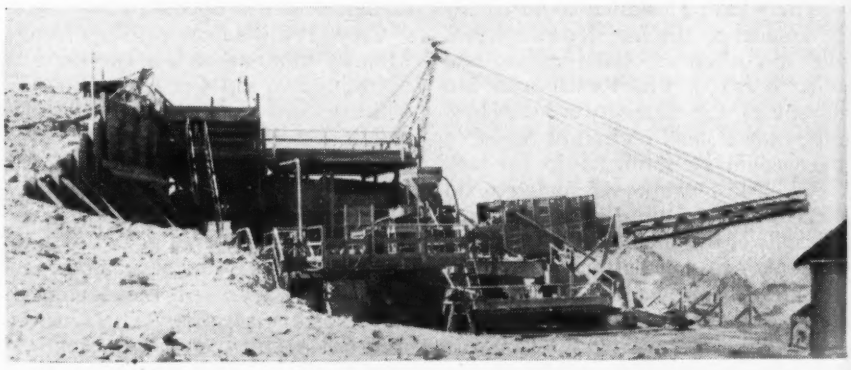
The property is being worked by Hoefling Brothers, of Sacramento, owners and operators of the Surcease gold mine in Butte County, who, some time before the issuance of the gold-mine-closing order by the War Production Board, turned their attention to strategic materials. Preliminary work, such as sampling and mapping, was started in April, 1942, and installation of machinery the August following. Production and additional development commenced soon thereafter and continued until April, 1943. Since then production has been steady. The finished scheelite product is exceptionally pure and high in grade.

Since the first World War the Atolia area has been a tungsten producer, the bulk of the output being obtained principally from lode deposits. The available placer holdings were long worked on a relatively small scale by primitive methods. In the early days, sections of the ground were worked with an ordinary plough, and the released scheelite fragments or "spuds" were picked up by hand, whence the origin of the name "Spud Patch" given to this placer. Later, hand pans, rockers, sluice boxes, hand and mechanical jigs made their appearance. Not until the late thirties were serious attempts made to employ large-scale operations and modern earth-moving and concentrating equipment.

The desert placer deposits currently worked are of recent age. They were formed by intermittent flows of water caused by freshets and cloudbursts, the scheelite contained being derived from scheelite-bearing quartz veins found west of the Spud Patch ground. It is concentrated in small and fairly continuous channels, with pay-streaks varying in thickness from 2 to 6 ft., and averaging 4 ft. Values are fairly constant. Thickness of the overburden varies from a few inches to 40 ft. Channels occurring in the lower part of the area are on monzonite, while in the upper area the bedrock is granite. The principal scheelite concentration is at or near bedrock.



MINING SCHEELITE-BEARING GROUND at the Spud Patch placer, Atolia, Calif. In the distance, an electric dragline with 70-ft. boom and 2-cu.yd. bucket. In the foreground, another dragline, diesel-driven with a 1½-cu.yd. bucket and 60-ft. boom



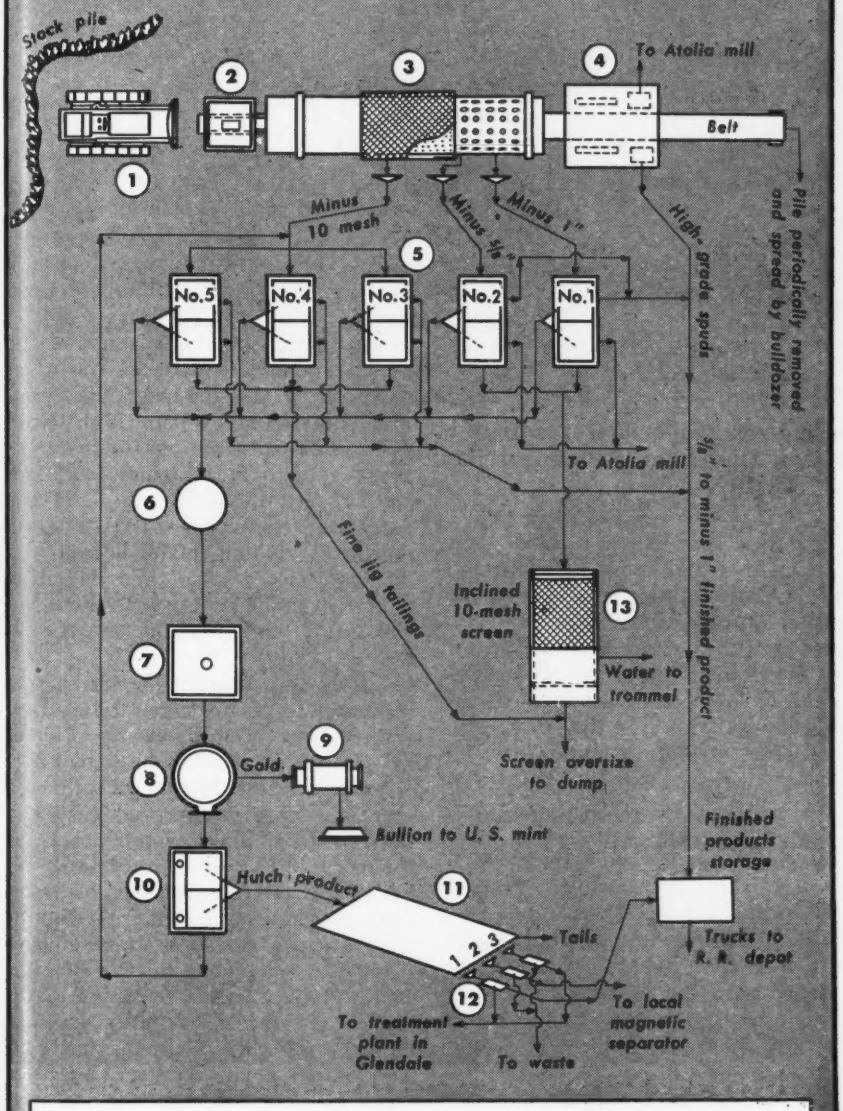
WASHING PLANT for recovering the scheelite, operated by Hoefling Brothers four miles from Spud Patch placer. Feed consists mainly of gravel from the pits, plus low-grade material mined from dumps

Three distinct types of pay-streaks are found—namely (1) those in which lime is the cementing material, (2) those with clay as the cementing material, and (3) those in which coarse boulders act as riffles to trap the scheelite particles. Some channels have been found which are a combination of all three. Scheelite particles vary in size from 10 in. to fines.

In the upper part of the placer area and below the vein outcrops mentioned previously, the scheelite is spread over a wide area, and farther down the hill there is a tendency to form channels. In these, concentration of scheelite at times occurs on the swift side of the bend in the channel, where it has been washed onto the high bedrock. Some of the material

SCHEELITE RECOVERY FLOWSHEET

used at washing plant operated by Hoefling Brothers to serve Spud Patch placers



LEGEND

1. Bulldozer
2. Mechanical feeder
3. 6x30-ft. trommel having 10-ft. scrubber section; a 10-ft. screen section with ½-in. openings and 10-mesh screen jacket; and 6-ft. screen section with 1-in. openings
4. Dark room
5. Five 44-in. jigs. No. 1, 2 and 3 are Bendelari jigs; Nos. 4 and 5 are Pan-American jigs
6. Sump for receiving hutch product of all jigs
7. Dewatering cone, 3-ft.
8. Ainlay bowl, 18-in.
9. Amalgamation barrel
10. Two-cell Harz-type jig
11. Straub concentrating table, 4x15-ft.
12. Three stationary 20-mesh screens
13. Dewatering box containing inclined 10-mesh screen

on or near the surface adjacent to the outcrops is 5 ft. thick. At the lower end of the area the bedrock is rather irregular, with some channels as deep as 60 to 80 ft. At the upper end the bedrock in some instances forms cascades with consequent concentrations of scheelite.

The entire area is honeycombed with old working shafts and prospect shafts. In these, cut samples were taken during the exploration period to determine the thickness of the pay-streak and values contained and the approximate contour of the channel under investigation. Some of the deeper lying channels were previously worked by underground methods.

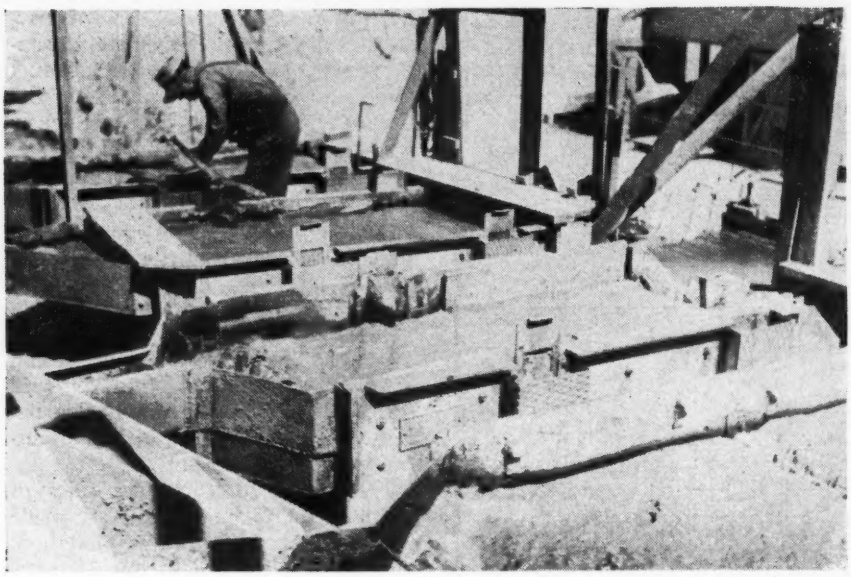
Equipment in use at the mine includes a Link-Belt electric dragline with a 70-ft. boom and a 2-cu.yd. Esco bucket, a Northwest diesel dragline with a 60-ft. boom and a 1½-cu.yd. bucket, a D-7 Caterpillar bulldozer, used at times for stripping overburden, 20-cu.yd. Mack trucks, 5- and 10-ton auxiliary trucks, and a repair and grease truck. Haulage of mined material to the washing plant 4.2 miles distant is done under contract.

Because of the irregular sides of some of the channels, cuts are made across the channel under exploitation, and not lengthwise as frequently practiced. Each pit is opened by first taking a cut on the edge of and lengthwise to the channel and laying the overburden out on high bedrock, and then taking a second cut next to the first and depositing the overburden in the first cut. This is continued until the opposite edge of the channel is reached. Subsequent series of cuts are taken across the channel as described, the overburden being laid back in the previous cut in each case.

Selective mining is practiced in all parts of the placer holdings. Original expectations of closer selection and dilution control to maintain relatively high-grade mill feed have been considerably modified in practice. Economic balance has been maintained by increasing the capacity to reduce unit costs.

Pit work is controlled by lamping at night during stripping operations. The work is done with Ultra-Violet Product, Inc., V-42 Mineralight lamps under supervision of the company engineer. Overburden is removed to within a foot or so of the mineralized zone, then skimmed by the bucket and lamped. The latter two operations are repeated until the top of the pay-streak has been fully bared. Once every evening a cut is made to bedrock to permit investigation of the cross-section of the pay-streak. At times one of the draglines is used to open up a prospect pit in virgin territory.

Mining is carried on in two 10-hr. shifts, and the daily production of plant feed ranges from 600 to 800 cu.yd. In addition, about 100 tons of low-grade lode material mined from dumps by a ¾-cu.yd. gasoline shovel is sent to the washing plant. It is used chiefly for breaking up cemented material in the trommel. The rock is lamped as it passes through the dark room covering a part of the stacker,



JIG SECTION of washing plant. Here the trommel-screen undersize is handled by twin-cell Bendelari and Pan-American mechanical jigs. Both kinds of jigs are 44-in. units

and the mineralized fragments are removed. When an appreciable tonnage has accumulated, it is sent to the Atolia mill for treatment. The material removed from the pit and hauled to the washing plant contains about 1.8 lb. WO_3 per bank-run yard.

At the washing plant, about 4.2 miles from the pits, the mined material is washed and screened in a revolving trommel, and the trommel undersize treated in mechanical jigs. Gold and other by-product minerals are recovered in a separate plant unit containing a 3-ft. dewatering cone, an 18-in. Ainlay bowl, a Harz-type jig, and a 4x15-ft. Straub concentrating table.

Most of the equipment used was taken from a portable washing plant formerly handling gold-bearing gravel, purchased and brought to the property after completion of exploratory work. Alterations were made locally.

Plant operations are graphically explained in the accompanying flowsheet. Proper sizing and steady feed are requisites to good recovery. Accordingly, the revolving trommel was provided with a mechanical feeder and adequate scrubbing and screening sections. A bulldozer is used to transport material from the stockpile to the feed hopper. The trommel is 6 ft. in diameter and 30 ft. long, and contains a 10-ft. scrubber section, 10-ft. screen section with $\frac{5}{8}$-in. openings and a superimposed 10-mesh screen jacket, and a 6-ft. screen section with 1-in. openings. Power is furnished by a 40-hp. motor.

The 30-in. conveyor belt on the 40-ft. stacker handling trommel oversize operates at 50 f.p.m. to permit hand-sorting of the ejected material. This is done in a dark room equipped with two ultra-violet lamps built over the center section of the stacker. High-grade particles removed from the belt go direct to the shipping plant, while those of lower grade are trucked periodically to the mill of the Atolia Mining Company. Waste dumped by the stacker belt is removed and spread about by a bulldozer.

In the jigging section two 44-in. Pan-American jigs and three 44-in. Bendelari jigs are available. All are of the twin-cell type. Three units (two P-A and one Bendelari) handle undersize from the 10-mesh jacket, one undersize from the $\frac{5}{8}$-in. screen section, and one undersize from the 1-in. screen section. All employ beds with 10-mesh openings and $\frac{1}{4}$-in. shot is added to the beds of the three fine jigs only.

Strokes and speed vary. The Bendelari units are operated at 130 r.p.m., and the Pan-American at 150 r.p.m. Strokes on No. 1 and No. 2 cells of jig 1 are $1\frac{3}{4}$ in. and $1\frac{1}{2}$ in. respectively; $1\frac{1}{2}$ in. and $1\frac{1}{4}$ in. on cells 1 and 2 of jig 2; and $\frac{5}{8}$ in. on all cells of jigs 3, 4, and 5. The $\frac{5}{8}$-in. and minus 1-in. material recovered by the two coarse jigs and that by the three fine jigs (10 mesh) go direct to the shipping plant. The hutch product from all jigs is collected in a sump at the head of the gold recovery plant. Tailings from the coarse jigs flow by gravity to a dewatering box containing an inclined 10-mesh screen, from which the reclaimed water is pumped back to the trommel wash sprays. Screen oversize and tailings from the fine jigs are pumped to a waste dump not far from the plant.

The collected hutch product is pumped from the sump to a 3-ft. dewatering cone, the underflow going successively to an 18-in. Ainlay bowl, and a Harz-type mechanical jig. Gold concentrates recovered by the bowl are treated in an amalgamation barrel, and the resultant bullion, nominal in recovery spread, is shipped to the U. S. Mint.

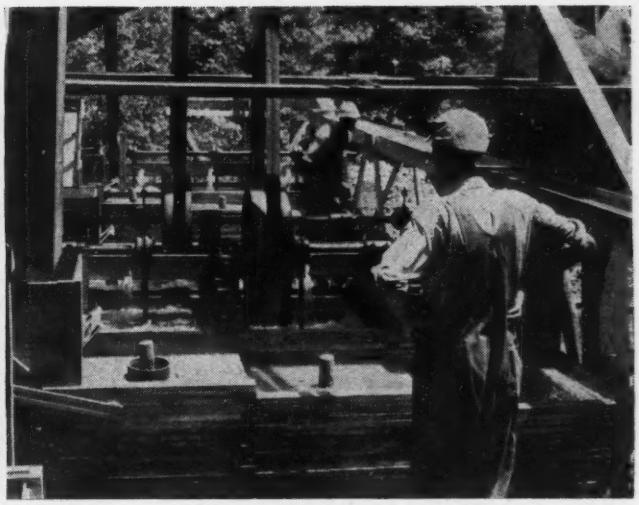
Tailings from the jig return to the heads of the three fine jigs, while the hutch product is passed over a 4x15-ft. Straub table. At the discharge end three stationary 20-mesh screens are installed for recovery of by-product minerals. Material separated by the first four table riffles flows over screen 1, the oversize or finished product going to the shipping plant, and the undersize to a treatment plant at Glendale, Calif., for magnetic separation and tabling. Oversize from screen 2 handling material from the two table riffles goes to the magnetic separator at the near-by Atolia mill, and the undersize to waste. Oversize from screen 3 handling material from the following three table riffles is mixed with the product shipped to the Glendale plant, while the undersize goes to waste.

About 35 percent of the total scheelite recovery is made on the picking belt, 40 percent on the coarse jigs, and 25 percent on the fine jigs and table. The finished product is exceptionally pure. A representative analysis of a mixture of all finished products is as follows: WO_3, 66.41 percent; tin, trace; arsenic, trace; sulphur, 0.03 percent; copper, 0.01 percent; phosphorus, 0.01 percent; antimony, trace; molybdenum, trace; manganese, 0.06 percent; bismuth, trace; and lead, none.

Water for plant operations is obtained from three wells on and near Cuddeback Lake about a mile away. Two wells on the lake equipped with Layne and Bowler 9-stage deep-well pumps furnish most of it. Electric power is received at 4,400 v. from the line of California Electric Power Company, and is stepped down by a transformer plant to 440 v. for plant use. A total of 29 men are employed at the property.

To J. W. Hoefling, managing member of Hoefling Brothers, thanks are due for his permission to publish this article, and grateful acknowledgment is made to Allan E. Jones, manager in charge of operations, and Henry S. Bates, mining engineer, for the help given me in assembling the information and data presented; also for the many courtesies shown me during my recent visit to the property. J. H. Frasher is mine and field superintendent, and Milo Horner, mill foreman.

FIRST USE of hydraulic mining in northern Arkansas succeeds where pick and shovel failed



FOUR JIGS, four screens, and a picking belt handle the ore at the Par-Mar concentrator

Hydraulicking Manganese

TOM SHIRAS, *Mountain Home, Ark.*

MANGANESE is now being mined by hydraulicking by one of the companies in the Batesville-Cushman field in northern Arkansas, marking the first instance of the use of the method for this purpose in the district. The operator employing it is the Par-Mar Engineering Company, of Batesville, who are working a property of approximately 600 acres in the Lafferty Creek area five miles west of Cushman. Maxin Cohen is manager of the company, James Wood operating engineer, and Stanley Hanford superintendent. The company also has a jigging plant for beneficiating the manganese ore.

The deposit under exploitation has been known for years but it could not be mined successfully with pick and shovel. Mr. Wood came into the field a year ago and worked out the plans for hydraulic mining. Some delay was experienced in getting the equipment but eventually mining was started.

Most of the slopes in the manganese-bearing area show the Fernvale limestone, locally called "grey rock." The ore occurs in a residual clay weathered from this limestone and consists of pieces that vary in size from fines to pebbles an inch in diameter. Occasionally larger pieces are found. The ore-bearing clay lies close to the tops of the hills and ridges and is present in most of the area. The company has proved, by pit and hydraulic tests, a 4500-ft. stretch of this clay on the hillsides within their property lines. The bed varies from 3 to 20 ft. in thickness and carries approximately 8.5 percent manganese.

Lafferty Creek, a clear, swift flowing stream, furnishes the water for both the hydraulic and milling operations. Pumping is done with a Manistee turbine pump, driven by a 125-hp. diesel engine, at a working pressure of 400 psi. The pipe line running to the nozzles is 7 in. in diameter and 2500 ft. long. Two nozzles, each having a capacity of 50 tons per hour, are used, working under a nozzle pressure of 275 psi.

Starting a Cut

In starting an hydraulic operation, a narrow ditch, about 3 ft. wide and 100 ft. or more in length, is cut into the clay, down to bed rock. An auxiliary flume is then laid in the ditch. A "cross-heading" ditch approximately 30 ft. wide is then cut at the upper end of the auxiliary flume ditch and sluicing is begun. The clay is cut out with the nozzles to bed rock. The water carries the ore-bearing material through the auxiliary flume into the main flume, which runs direct to the mill. After the clay has been cut out up to the side of the mountain, another similar cut is immediately started.

The main flume leading from the auxiliary flumes to the plant is 600 ft. long, 2 ft. wide and 1 ft. high, constructed from lumber. It is set at a sufficient slope for the water to carry the solids to the plant.

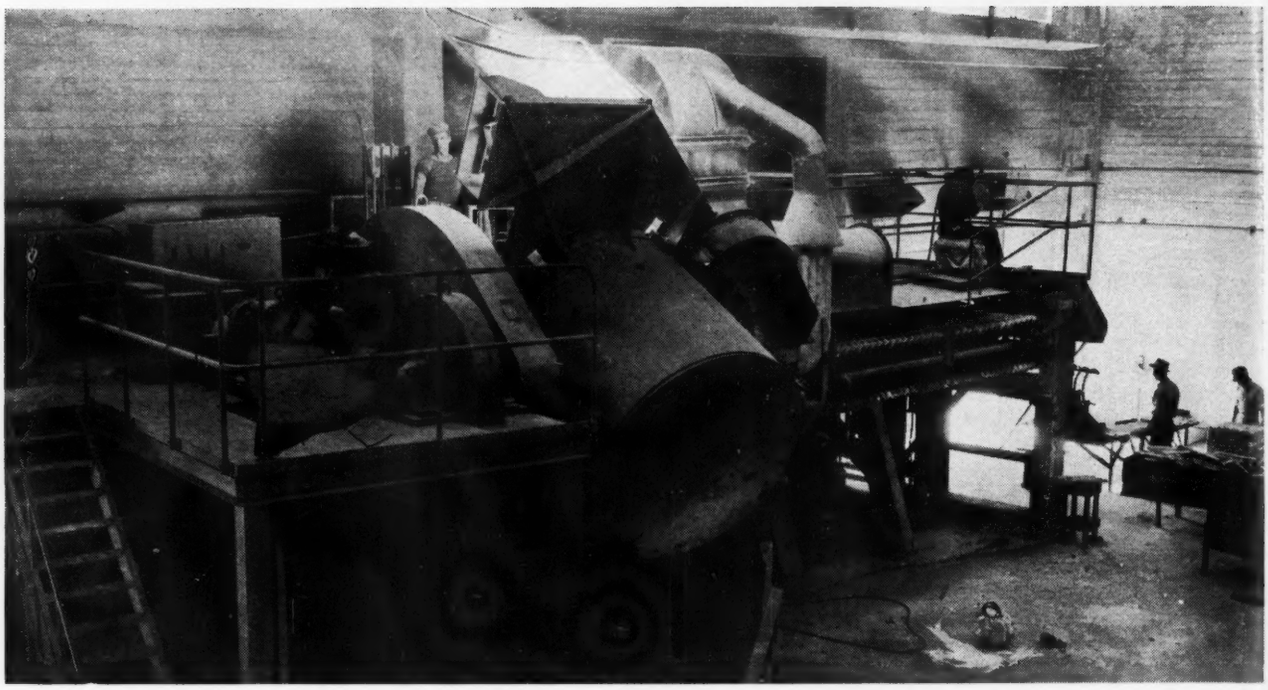
Equipment in the concentrator consists of four screens, a picking belt and four sets of jigs. Each jig has three 36x42-in. cells. Other equipment, consisting of a V-tank for fines and slime, and three Wilfley tables, will be added to the plant as soon as possible.

Ore and clay from the main flume first go to a scalping screen having a 1-in. hole. The oversize goes to the picking belt where pieces of manganese ore are removed by hand, the waste discharging from the end of the belt.

The 1-in. material goes to a second screen having a ¾-in. hole. Oversize is sent to No. 1 jig. The undersize from this screen goes to a third screen having a ½-in. hole, the oversize of which goes to jig No. 2. The undersize is sent to a vibrating screen with a ¼-in. opening, the oversize of which in turn goes to jig No. 3. The undersize of the last screen, from ¼-in. to 10 mesh, is delivered to jig No. 4. All of the jigs are equipped with bandelier rings to take care of any excess of concentrates of very coarse size.

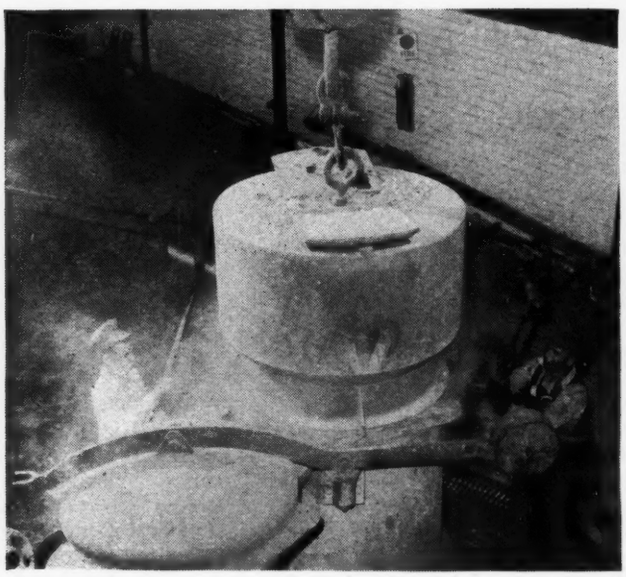
All of the material moves through the plant in box flumes by gravity.

Par-Mar Engineering Co also has holdings in Bone Cave Hollow, three miles northeast of Batesville, on which they have done some preliminary work. The ore on this property is in hard rock, and carries about 75 percent carbonate and 25 percent oxide.

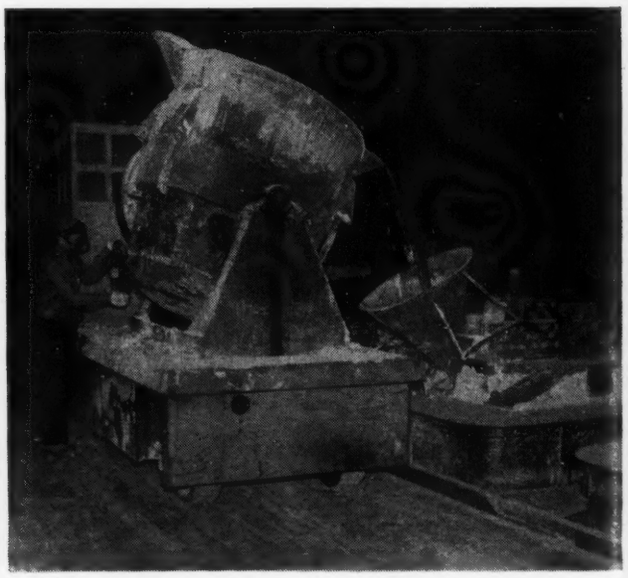


INGOT CASTING machines of this type are the pride of Basic Magnesium's new refining plants. Operating automatically, the machine casts four tons of 6-lb. magnesium ingots every hour. Metal loss and health hazard are minimized. See also E. & M. J. for Oct., 1943

Basic Magnesium's Equipment in Action



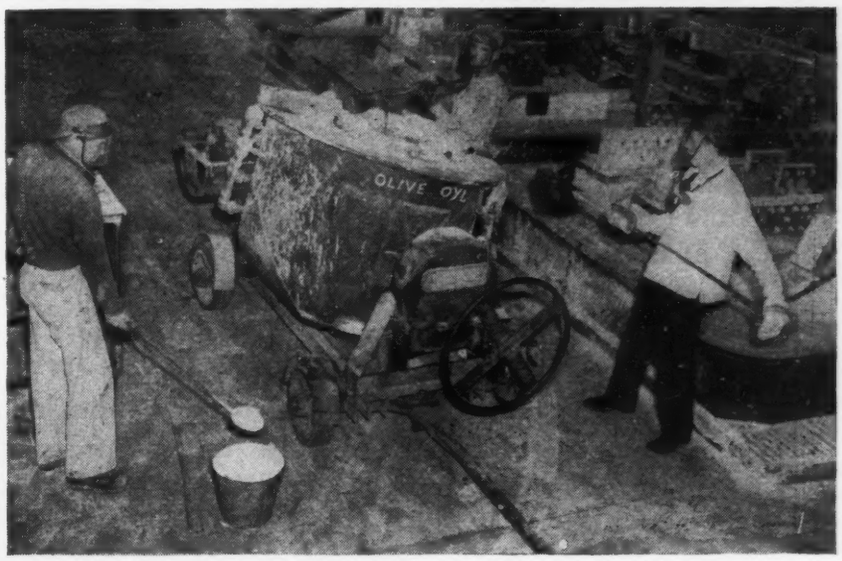
DRY MIX is charged into a chlorinator for treatment with chlorine gas to produce molten magnesium chloride for electrolysis



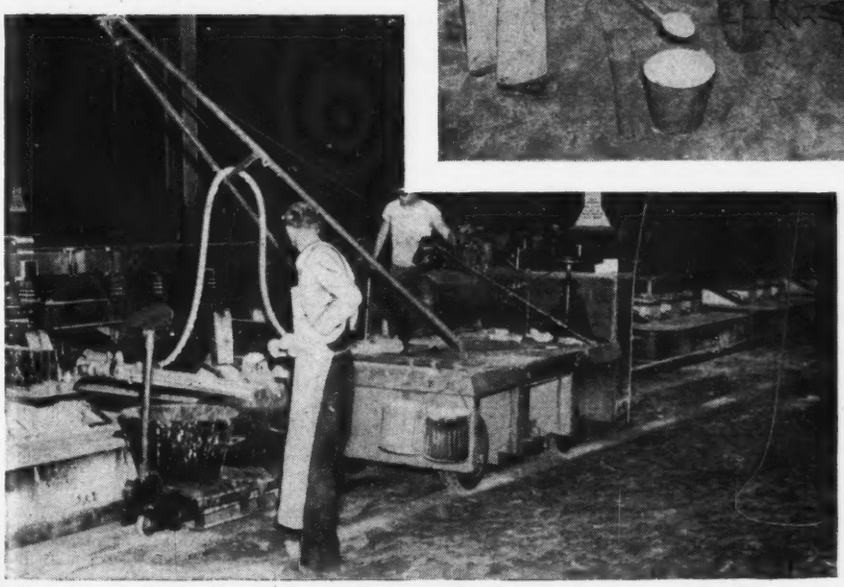
ANHYDROUS magnesium chloride, tapped hourly from the chlorinators, is poured into an electrolytic cell for conversion to metal

For the first time in any publication, detailed action photographs are presented of machines that broke production records at BMI in Nevada

WORKING in temperatures often over 160 deg. F., these men ladle magnesium metal out of an electrolytic cell. Man at left has flux ready to douse fires starting in metal car, affectionately dubbed Olive Oyl →

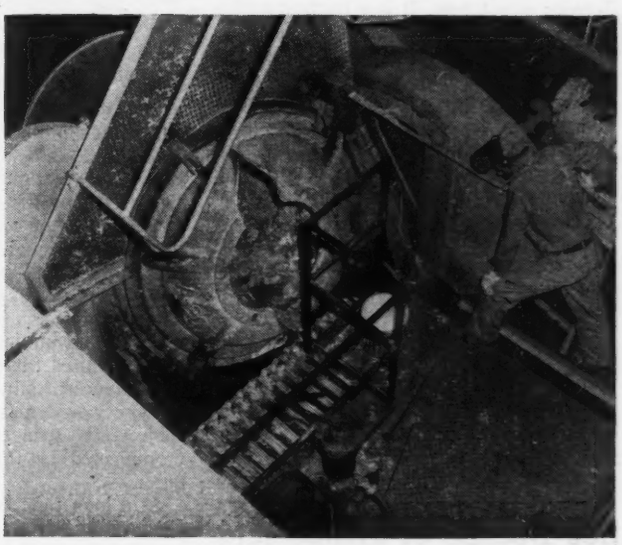


For permission to publish these pictures, E. & M. J. thanks F. O. Case, manager, and Guernsey Frazer, administrative assistant, of Basic Magnesium, Inc.



NEW METHOD of suction pump withdrawal of molten metal from electrolytic cell is example of constant effort at BMI to find mechanical means of eliminating arduous hand labor typified by operation shown in above photo ←

THIS 2-TON POT of purified magnesium is on its way to the casting machine shown on the facing page. Stacked ingots at left of pot await refining



FIRMLY HELD in the casting machine, the pot is tilted to pour its two tons of metal into a mold chain moving under it. No fumes escape

Most Mining Men Oppose General Land Office Plan

In the September number of Engineering and Mining Journal the editors reported a proposed program of the General Land Office, part of which contemplated federal control of all mineral deposits on the public domain. This was to be accomplished by extension of the provisions of the Leasing Act of 1920, requiring permission to prospect and the payment of royalties on mineral production.

Numerous letters have been received from subscribers in response to the editors' request for reactions to these proposals. It is possible to present, in whole or excerpt, only a few of the replies received. Almost unanimously they condemn the proposed federal control of mineral deposits on public lands, but a few correspondents regard it favorably. The editors present the summary for the information of the mining industry and of the General Land Office.

Senator Scrugham Opposes

Senator James G. Scrugham of Nevada publicly opposed the announced plan and released a statement in which he said:

"This proposal of the Secretary of the Interior is not new. It is a bugbear which is periodically raising its ugly head to plague our mining industry. These continued and pernicious attempts to abrogate the well-tried laws upon which our great country has developed its vast mining industry in a tradition of rugged individualism do the Interior Department no credit. The move is particularly surprising when one remembers that similar land-grabbing attempts in the past have generated such an antagonism to the Secretary among Western miners that his frequent good acts have been overshadowed in many minds.

"You can inform the Interior Department that Western Senators and Congressmen will never permit such a perversion of our system of free enterprise which has saved many a common man from poverty and added billions to our national wealth."

See Decline of Prospecting

The majority of the replies received showed strong opposition to the proposals of the General Land Office, not so much to the plan for federal registration of claims as to the idea of federal control of prospecting, development and operation. The general tenor of most of the replies can be summed up in this statement: Without the incentive of reward in the form of ownership of claims, prospecting on the public domain will certainly wane, if it does not cease altogether. Following are some typical comments.

Any westerner who has experienced the hazards of mining gold, silver and base metal ores, easily can foresee the stagnation and a long period of inactivity to be suffered by the mining industry should our Secretary of the Interior be successful in pushing through Congress the proposed bill to place all mineral ground on the public domain under a leasing program. The proposed bill would force the locator or lessee of a mining claim to pay a royalty to the United States Government on any ore produced from the mining claim, and likewise would make the locator or lessee subject to stringent regulations to be promulgated by the Secretary of the Interior.

As a long time subscriber and reader of *Engineering and Mining Journal*, it is the hope of the writer and his associates that you will expose this plan and give the proper support to the many western Congressmen who, no doubt, will fight the bill with the same courage and tenacity heretofore shown when this matter has come before Congress.

Reno, Nevada — H. B. Chessher

Adopt the leasing system and you do away with the prospector and practically all new discovery. The prospector is not going to ask for a permit to hunt for mineral that he cannot own, that cannot be held without endless red tape, and that probably would require a heavy bond (which the prospector could not furnish), and could not be worked without paying a royalty. This royalty is an obstacle to a bond and lease because the royalty which would go to the prospector, to assist in paying for the mine, must go to the government. Other countries have tried to develop their mines by government control and have failed. Shall we adopt a system which had stifled development all over the world? Why give up a system which has stood the test of time, and given us the greatest mining development of the world?

Long Beach, Calif. — Sidney E. Bartlett

I wish to go on record as being absolutely against Federal control of mineral deposits on public lands. During my 50 years in the West I have found that there is very little prospecting or developing of mineral on private land, and knowing the temperament of the prospectors and others engaged in mining I doubt if very many

would ever take out a license to prospect.

If we cannot find new deposits, then mining will die out in the next decade. I doubt if the General Land Office knows how much employment the small mines give to local miners. Paying a royalty would cause many small mines to close altogether. Most small mines could not afford to pay a royalty to any one.

Pine Grove, Calif. Fred W. Sprung

Under the proposed control of all mineral deposits, the prospector would no longer receive the full benefit of his discovery. Though this fact would not halt all active prospecting, it would materially reduce the number of free lance prospectors. It would therefore become necessary for the government to organize some sort of prospecting. Such organization would obviously cost money.

Governmental (political) control over an industry as specialized and technical as the mining industry, seems to me to be hopeless. With politicians at the helm, there could never be the advancements that are possible with the present day set-up.

The conservation and reduction of waste is a good point, though it hardly finds application when considering the larger properties. Small "high-grading" operations would be the worst offenders, but their effect on the whole industry is not great. The well-developed, advancing operators are, for their own benefit, utilizing all the various possibilities. The government control would not make any difference as far as the economics of an ore is concerned, in that premiums and subsidies will soon be a thing of the past. Therefore, an operator trained in the mining field will be able to do more at conservation than many political engineers.

Rio Tinto, Nevada W. T. Swensen

The proposal of the General Land Office to withdraw the old and well known method of locating, proving and patenting mineral lands, and substitute a leasing system, will, if effected, prove substantially the end of prospecting and developing of such minerals as lead, zinc, copper, gold, tungsten, etc. As one having fifty years' experience in the western mining states with the development of mining prospects and in much rarer cases of observing good prospects develop into mines, I am sure no such progress could have been made by any other method than the one prevailing to date; and that under the heavy hand of Washington bureaucracy most of the western mines supplying this nation and the world with needed metals for the past seventy years would have remained undiscovered. Unfortunately, the mining industry now faces an attempt to socialize it. There is no greater gamble than that of prospecting for, and gradually making a prospect into, a going mine. The ratio of successes is probably less than 1 to 1000. Bureaucrats and millions of uninformed persons have no idea of the risks, losses, and bitter disappointments attached to prospecting for minerals, but mistakenly think one walks into the mountains, locates a mining claim and lives a life of ease thereafter. The grossly exaggerated stories of successful ventures promote such impressions. It will be a sad day if Mr. Ickes succeeds in his leasing plan.

New York, N. Y. V. P. Strange

I want to stress the new discovery angle. Without the prospect of making a fortune or a quick cash sale, who is going to do the prospecting? Oil and coal are developed on leased land by the large corporations. Leasing mineral lands will be the end of small mines. The small mine owner will not be able to finance.

The people have lost nothing by the present system. Mineral in the ground and undiscovered is worth nothing. Even if one could prove a financial loss, we had better suffer it than to lose all our liberty. Henry Mears

From my knowledge, experience and observation for these past fifty years, I would unhesitatingly say that it would be against the best interests of the public and of individuals to change the law and the method of operating mining property to the lease method. In addition to the five disadvantages listed on page 50 of the September issue of your publication, I would say in emphasis if not in addition to those points, as follows:

Such a change is a radical departure from the principle of individual effort to a broadening of the present dangerous tendency of "too much government" and would build faster and larger the bureaucracy towards which we have drifted and are hurrying.

It would favor the rich and powerful interests and aid in the development of monopolies in mining, to the exclusion or prejudice of the prospector, the occasional mine seeker and the young men who would turn to mining from the schools and college fresh from their studies of the subject.

Mining is so different from petroleum development, that if it is thought the lease system is best for oil, it would not at all follow that it would be good for metals. It is not to be thought that all of the deposits of minerals and gold and silver have been discovered; but if the incentive to own a "find" were withdrawn, there would be little prospecting; and there would be little or no leasing of unknown public lands.

Los Angeles, Calif. Frederick H. Whitefield

Proposal Favored by Some

Writing from New Mexico and California, two operators, at least, see no danger to the mining industry in the proposed program of federal control. On the contrary, they think it will prove beneficial. They say in part:

Federal leasing is not a cure-all nor a kill-all for the mining industry. The idea is not new and is not bad.

In fact, our South American neighbors retain the title to their mineral lands and grant to operators only semi-annual permits, automatically renewed as the taxes are paid. Yet Yankee capital is heavily invested in the mines and some experienced investors prefer South American mining laws and practices to ours. I have a high regard for the mining laws and practices in Canada. The system there is like ours used to be—free enterprise and unlimited opportunity for all, with the technological assistance and encouragement of the Canadian Government. Drastic changes ought to be made at once in our mining laws and practices in United States. Our law makers should study the Canadian and the South American ways and incorporate their best features in the system they adopt.

If you will take time to investigate, you will find that our mining laws are chaotic, contradictory, ambiguous and the direct cause of misunderstanding and litigation. Nearly every Mining Congress has asked for their revision but the mining lawyers in the United States Senate are smart enough to keep them on the statute books.

In constructing our new mining laws, the General Land Office will fail unless it regards the prospector as the very foundation of the mining industry, and therefore makes laws which will foster and encourage prospecting, the searching for and the discovery of new mineral deposits.

The new mining law could require the applicant for a prospecting permit to submit to an examination to qualify himself as a genuine prospector, not a mere wanderer hoping to stumble over a pot of gold. The qualified prospector might receive $60 a month assistance from the General Land Office, as is done in some other countries.

He should report whatever minerals he may discover so that they may be officially examined and he may be advised about the work he should do to follow up the leads or veins, and if the vein develops into a real prospect, an official report should be issued which he could use in raising capital for mining development.

Of course, the General Land Office will find out and admit in the not distant future that copper, vanadium, lead, zinc, molybdenum, gold, silver, and similar metallic elements occur in lodes and veins, and are not analogous to coal, phosphate, oil-shale, oil and gas.

They will find out also that there should be close cooperation of the Geological Survey and the Indian Office or the Bureau of Mines in checking weights of ore, sampling and assaying, so as to insure payment of all the royalty due the Government upon ore removed from the leased property.

If federal leases are to supersede our present chaotic and difficult mining laws and practices, mining courts will have to be established before which the lessor's local representative may be cited for unjust, capricious or discriminatory treatment of the plaintiff. Such cases should be tried and decided within thirty days. On the whole, therefore, I favor the proposals of the General Land Office,

because I believe that any change is better than what we have.

Farmington, N. M. Thomas F. V. Curran

As a holder of claims and as a mine operator in California, I believe I can give some reasons why federal control would be a boon to, and benefit, both prospector and prospective operator in this State.

To remove registration from the jurisdiction of the counties would in itself justify the proposed act. Most of our mining counties are completely controlled by cattlemen who own, control and actually are the county government. Thus they are able to, and do, block prospecting and development of much potentially productive mineral land. They can and do readily accomplish this end by falsely assuming ownership of government property; by falsely assuming mineral rights on purely grazing lands; by falsely claiming contamination of water supply and blocking the construction of access roads. These are the main methods of closing thousands of prospective claims to the prospector.

Not knowing the contents of the proposed act, I believe it should include the following:

First, that a small rental should be required until actual production is commenced. Then proceed on a royalty basis. Both to be small enough not to stifle development. Mining as a whole cannot stand the amount of royalty that oil can carry.

Second, that a definite period of time be allowed between location and start of operations. Failure to start operations to lay claims open to filing.

Third, that all claims now held and not worked be classified as above.

So in my mind control by the government will open thousands of mining possibilities which under local control are closed by so many abuses that the benefit to the mining industry will greatly overshadow whatever the government may derive from the industry.

Inyokern, Calif. Wm. J. Petty

Regulations of Other Countries Should Be Examined

If you have not already done so I suggest that you make a special effort to secure the views of men who have prospected and operated in countries where these regulations have been in force for some time.

I believe that prospector's licenses are required in order to prospect on the public domain in Canada. I do not know the purpose of this, or whether it has been an aid or a hindrance to the mining industry in that country.

Again, what do American operators think of the leasing system that is in practice in Mexico. What are its disadvantages and advantages if any?

If royalty is to be the only tax on production, we can point to many cases where it would have been advantageous to the operator, and to some where even a small percentage royalty would have been discouraging. If the royalty is to be only a basic tax upon the top of which may be imposed an unpredictable profit tax, it will certainly discourage prospecting and operating.

West Chester, Pa. F. F. Sharpless

Political Favoritism Feared

The plan to lease all mineral lands to individuals does have certain advantages. However I believe it has disadvantages which outweigh any possible combination of advantages. Specifically, I have in mind the probable use of political favoritism and the virtual certainty that the law will result in reduced mineral discovery. Any plan involving the total or partial removal of incentive is bad. Any plan that concentrates the power to bestow and take away mineral lands in the hands of one or a few is likewise bad. The answer to national mineral conservation and maintenance of mineral reserves, I believe, is government price and tariff regulation to meet varying national needs for a given metal. The remaining advantages listed in your September issue seem to me to be pitifully small gains to receive in return for hocking our freedom of action.

Eureka, Utah W. M. Stoll

Mining Associations Object

Two State mining associations, one in Washington and the other in Arizona, acted formally on the matter, passing resolutions from which we quote in part:

Any leasing system requiring permits for prospecting and leasing by the Government at fairly high royalties and under rigid regulations would practically eliminate the prospector—the mining pioneer. It would destroy the initiative and incentive so necessary for the discovery of new orebodies. Even the large mining companies wait and depend on the lowly prospector to show them his ore exposures in open cuts and tunnels. Without the prospector most of our mineral resources would remain untouched. And even large mining companies would suffer in the long run.

As demonstrated in the various fields of industry during the last 12 years, rigid and expensive regulations drive the small operator out of business and place the large companies into greater advantage.

The application of this Act to the lode deposits of the base and precious metals of the country would be entirely unsuitable to the complex conditions found in this section of the mining industry. The present system of staking mineral claims is universally understood in the mining industry of the West. It has been the procedure for over 90 years; and a series of practices and code of laws have been developed that are well understood and aim at a fair and proper solution of the many complicated questions involved in this phase of the mining business.

Extending the policy of the 1920 Leasing Act to all minerals would greatly dislocate and retard the future progress of the mining industry; whereas the free enterprise system has stimulated the production of vast mineral wealth in the West ever since 1849.

We, the West Coast Mineral Association, of Seattle, Washington, urge Congress not to enact into law any such plan, but instead to preserve the existing general mining law for locating and holding mining claims.

Seattle, Washington West Coast Mineral Association, M. H. Van Nuys, Chairman, Legislative Committee.

Under the leasing regime the locator will have to pay the expenses of a registered U. S. mineral land surveyor for definite description of the ground, an outlay of money that few prospectors can stand. He will have to wait for a Government engineer to examine the ground and report thereon. There will be the inevitable waiting for the cumbersome red tape to unravel; and if the ground should prove promising the temptation to deny the lease to the original applicant, to the prospector who found it.

Perhaps the locator, after long waiting, financial outlay and many uncertainties, receives a lease; his ore is seldom of high enough grade to stand the exaction of the royalty asked by the Land Office and leave him any margin for development. The revenue collected will not pay for the administration.

After all what is wrong with a system that has been so fascinating to thousands of men that they have devoted their lives to it, the nation thereby being enriched by untold millions. The ramifications of the system benefit many thousands through the development of a great basic asset. It has grown to be a great power because it was unhampered.

We who follow mining have no cause to wish a change. Our system has stood the test of time, was the outgrowth of experience. This is our way of life, this is our land; the system under which we have toiled has been a precious freedom that we are loath to lose.

With the writing of a location notice, the building of a monument of the stones at hand, and with title guaranteed by his Government, the prospector is ready to start the development of a possible mine. What could be simpler, or more efficient? This way has been the birth of all mines. The costs to the Government have been negligible, the benefits colossal.

With due respect to the Land Office and their desire to further the interests of the Government, we feel that their knowledge of the question is limited and therefore dangerous. When we find the present way inadequate, we will call for changes through our duly elected representatives.

This letter presents the views of the members of the Kingman Council of the Arizona Small Mine Operators Association.

Kingman, Arizona J. H. Smith, Chairman
W. C. Babcock, Secretary

How Prospectors Can Detect Beryllium in Ores

FRANK KULCSAR, *Brush Beryllium Co., Cleveland, Ohio*

IN ANSWER TO the long-felt need for a rapid, reliable test for beryllium which could be performed with simple apparatus in the field as well as in the laboratory, the following procedure has been developed. Although it will not reliably detect amounts of beryllium much less than 0.8 percent, the method is accurate for larger amounts, and in any case, rocks carrying only 0.8 percent BeO would be valueless at present.

Spot Test Reagent Used

The method involves the use of p-nitrobenzeneazoorcinol as a spot test reagent, and in this use, the test is not new.* The following description will supply detailed working instructions and precautions to observe in applying the reagent to ore testing.

The accompanying photograph indicates the necessary equipment. Most prospectors will already have these items, other than the special reagent, and this, despite its formidable name, can readily be purchased from any chemical supply house or from Eastman Kodak Co., Rochester, N. Y.

The ore or mineral to be tested should be crushed and ground in the two mortars to about 200 mesh. Then about 1.5 g. (13 to 15 pellets) of NaOH is melted in the nickel crucible, heated to a dark cherry red, and allowed to cool. By means of the spatula, 0.08 to 0.10 g. of the powdered ore is added to the crucible, and the melt is once more heated to a cherry red. The bulk of 0.10 g. of mineral on the spatula should be noted, and the amount estimated in subsequent tests. Critical accuracy at this point is unnecessary.

The melt is held at a red heat for about five minutes, then allowed to cool until solid, and the crucible is finally set into cold water. Then 10 cc. of cold water is added to the crucible and the contents stirred until the melt has completely dissolved. The crucible is kept immersed in water during this process so that its contents will remain cool.

WITH THIS EQUIPMENT and an alcohol lamp, it is possible to determine quickly the presence in an ore sample of significant quantities of beryllium. Included are: (1) a crushing mortar, (2) a grinding mortar, (3) a 20-cc. nickel crucible, (4) glass spatula, (5) NaOH pellets, (6) 25-cc. graduated cylinder, (7) stirring rods, (8) special reagent, see text, (9) filter paper, (10) 25 percent KCN solution

With a stirring rod, two drops of p-nitrobenzeneazoorcinol solution are then placed on a double thickness of filter paper, and on this same spot is placed a drop of 25 percent KCN solution. In the center of this large spot, a small drop of the solution from the nickel crucible is then placed. A pink coloration of the spot will indicate the presence of BeO. Absence of a pink color means that the sample has less than 0.8 percent BeO or none at all.

The p-nitrobenzeneazoorcinol solution is prepared by dissolving 0.025 g. of the reagent in 100 cc. of normal (4 percent) NaOH solution. Warming the beaker slightly will aid in dissolving the reagent. The solution should be kept in a rubber-stoppered bottle, and should not be used until the reagent is completely dissolved or misleading red flecks will be produced in the test.

The best light for observing this test is bright daylight, not sunlight. If the BeO content of the sample is small, the pink color may appear only slowly, but if no color appears by the time the spot is dry, BeO is absent. No conclusions should be drawn from the spot after it has dried completely, because color already produced fades upon drying.

Upon dissolving the melt in water, if a turbid solution is obtained, the precipitate may be allowed to settle and only the clear solution used in the test. A fresh p-nitrobenzeneazoorcinol solution should be made up every two weeks in order to insure accuracy. To test the solution, the spot test should be run on an ore of known beryl content, preferably one containing about 1 percent BeO. A quartz-beryl mixture resembling an ore containing 1 percent BeO may be obtained from Brush Beryllium Co., 3714 Chester Ave., Cleveland, Ohio.

*A. S. Komarowsky and N. S. Poluektoff, *Mikrochemie*, 1933–34, 14, 315. F. Feigl, *Spot Tests*, 2nd English Ed., p. 121.

Acid-Grade Concentrates from New Mexico Fluorspar

HOWARD WINN, *Metallurgist, Continental Chemical & Ore Company, Inc., Silver City, N. M.*

THE NEW CONCENTRATOR of the Continental Chemical & Ore Company, Inc., at Silver City, New Mexico, has been in continuous operation since August, 1942, a month after the pilot plant test runs had been successfully completed. The ore handled consists of that obtained from mines owned by the company at Glenwood, in the same State, and custom ore shipped from various other districts. It is received both by truck and by rail.

In general, the fluorspar ores of the Southwest do not lend themselves to the production of acid-grade fluorspar, and it was for this reason that considerable test work was necessary before starting up. The current practice is explained in this article.

The three coarse-ore bins, having a combined capacity of 300 tons, are installed end to end, being served by a single conveyor. This permits the operator to draw ore from each bin separately or from any combination of them, thus making it possible to get a mixture of ore in any combination desired. The mine-run ore often is sticky and wet and it was found that the simplest way to obtain a fairly continuous flow from the bins was to feed by hand from chutes onto the 16-in. inclined belt conveyor. This discharged over a steel grizzly having 1-in. openings, the oversize going to a 10x20-in. Eureka jaw crusher set to 1 in. The undersize with the crushed ore was elevated to a set of 14x28-in. rolls installed above the 120-ton fine-ore bin.

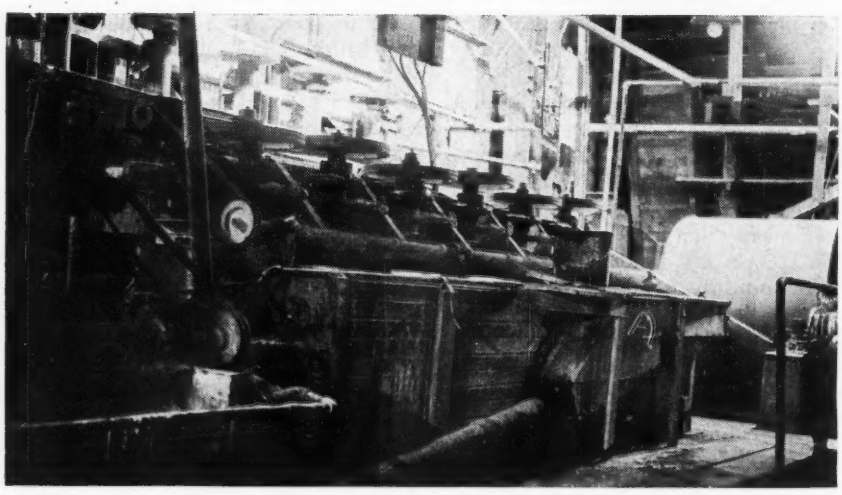
From the bin the material is withdrawn by means of a Morse adjustable feeder and conveyed to the ball-mill scoop box. The feed is 3 to 4 tons per hour, depending on the hardness and other characteristics of the ore. Grinding is done in a 5x4-ft. Morse ball mill operating in closed circuit with a 48-in. Dorr duplex classifier. Ball mill discharge is held at 65 to 70 percent solids, and the classifier carries a circulating load of 300 to 500 percent, depending on the hardness of the ore. Classifier overflow is maintained at 28 to 30 percent solids. A typical screen analysis is:

Mesh	Percent	Cum. Percent
100	8.0	8.0
150	10.0	18.0
200	38.8	56.8
−200	43.0	99.8

Classifier overflow is pumped by a 2-in. Wilfley sand pump to a 6x6-ft. locally built conditioner. The conditioned pulp goes to the third cell of a 10-cell bank of No. 18 Denver flotation machines. Froth from cells 3 and 4 (actually the first two rougher cells) is combined with that from cells 1 and 2 to form the combined rougher concentrate. Concentrate from the remaining 6 rougher cells is returned to cells 1 and 2 for cleaning.

The combined rougher concentrate is fed by gravity to the third cell of a six-cell bank of 24-in. Morse-Weinig machines. The double-cleaned concentrate from the first cleaner flows by gravity into the third cell of a similar recleaner, where two more cleaning stages take place. Final concentrates

FLOTATION PLANT of Continental Chemical & Ore Company, in Grant County, New Mexico. This mill has now been in operation for 18 months since test runs were completed



INSIDE THE CONCENTRATOR. Part of the flotation section is seen. On the right is the ball mill

are taken from either two or three cells of the recleaner unit.

The combined cleaner tails are pumped by a 2-in. Wilfley sand pump to an 8x8-ft. thickener. The underflow is returned to the conditioner, and the overflow is used in the classifier as dilution water. Rougher tailings are pumped by a 2-in. Wilfley sand pump to the pond 600 ft. away. The clear overflow is returned to the mill for re-use. Substantial savings in reagents is anticipated.

Reagent consumption fluctuates materially, principally because of a highly changeable mill feed. An accompanying table gives the consumption for a composite ore assaying CaF_2, 65.6 percent; SiO_2, 21.8 percent; $CaCO_3$, 8.4 percent; and R_2O_3, 4.2 percent.

Reagent Consumption for Composite Ore (See text)

Reagent	Place Added	Lb./Ton
Oleic acid	Conditioner	0.50
Oleic acid	No. 6 rougher cell	1.25
Oleic acid	No. 9 rougher cell	0.25
Soda ash	Ball mill	2.00
Sodium silicate	Conditioner	1.00
Sodium silicate	Recleaner cell	0.25
Quebracho	Conditioner	0.50
Quebracho	Recleaner cell	0.10
Starch	Conditioner	0.30

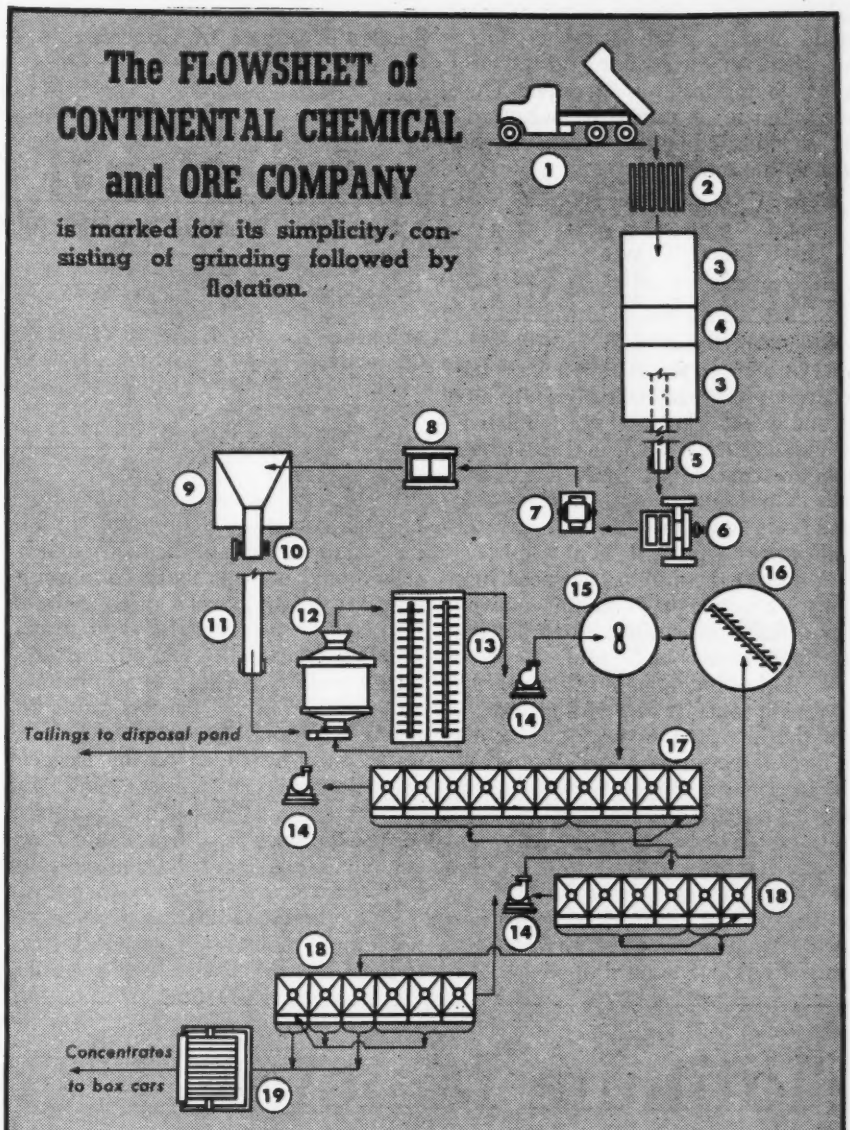
No frothing reagent is used and it was found necessary to add oleic acid in stages to prevent the froth from dying away on the last rougher cells. The thickened cleaner tails carry some reagents, which accounts for more oleic acid being needed on the fifth rougher cell than on the first. The pH of the classifier overflow is maintained at 8.5 to 9.0. Recently, a cold-water-soluble type of quebracho has been obtained, which is easy to prepare and feed. Alcohol solvent "Solox" is mixed with the oleic acid (one part Solox in five parts oleic acid), which makes the oleic acid much easier to feed, and also serves as a froth conditioner.

Cleaner concentrates flow by gravity direct to an 8x8-ft. Oliver filter. The resultant cake is discharged at 12 percent moisture, and is subsequently shipped in paper-lined box cars.

Water is pumped to a 100,000-gal. tank above the mill from a well sunk in the gravel of San Vicente Creek ¼ mile away. A two-stage centrifugal pump lifts it about 140 ft. through a 5x12-ft. Bowers zeolite water softener. This unit has a capacity of 1,200,000 grains of calcium and magnesium hardness, and the softener must be regenerated every 18 hr. of operation. Salt for the purpose is brought by truck from a deposit at Quemado, New Mexico, 200 miles north of Silver City. The well water contains from 18 to 20 grains in calcium and magnesium hardness, and is delivered at zero hardness.

The FLOWSHEET of CONTINENTAL CHEMICAL and ORE COMPANY

is marked for its simplicity, consisting of grinding followed by flotation.



LEGEND

1. Dump trucks, 5-ton to 20-ton
2. Steel grizzly, 4-in. spacing
3. Crude ore bin, 120 tons
4. Crude ore bin, 60 tons
5. Inclined conveyor, 16 in. wide
6. Eureka jaw crusher, 10 by 20 in.
7. Elevator, 9-in. buckets
8. Rolls, 14 by 36-in.
9. Fine ore bin, 120 tons
10. Morse Bros. ore feeder, 18-in.
11. Inclined conveyor, 14 in.
12. Morse Bros. ball mill, 5 by 4 ft.
13. Dorr duplex classifier, 48 in.
14. Wilfley sand pump, 2 in.
15. Conditioner, 6 by 6 ft.
16. Thickener, 8 by 8 ft.
17. No. 18 Denver flotation machine, 10-cell, 28 by 28 in.
18. Weinig flotation machine, 6-cell, 24 by 24-in.
19. Oliver filter, 8 by 8-ft.

As stated previously, many fluorspar ores of the Southwest are not easily converted to acid-grade "spar." The chief reason is the very intimate association of the fluorite with silica, calcite, and other objectionable minerals. An accompanying table shows a screen analysis of a concentrate made from a particularly difficult ore in which the mill heads ran about 30 percent silica.

It is strongly indicated by this analysis that a satisfactory separation cannot be made until the material is ground to minus 200 mesh. However, this in itself is not the actual problem. Early in the operation of the pilot plant it was found that, when treating this difficult type of ore, grinding through 200 mesh

would produce a satisfactory product, but whenever such a fine grid was obtained tailing loss was excessive. This was found to be caused by overgrinding, as indicated by this screen analysis of a tailing sample:

Mesh	%	Cum. %	CaF_2 %
65	2.6	2.6	25.8
100	16.4	19.0	26.3
200	42.8	61.8	26.4
−200	38.1	99.8	31.8

Starch prepared with caustic soda used as a slime flocculator helped the recovery greatly in such cases. Results of one week's operation are tabulated.

This recovery is held satisfactory, and the concentrate easily meets the new Government specifications for acid-grade fluorspar of 97.5 percent CaF_2 and 1.5 percent SiO_2.

Although the mill has not been running long enough to permit making any definite conclusions, the following observations may be helpful.

1. A moderately hard water may be used with some success with oleic acid, but the increased recovery and saving in reagent consumption will more than pay for softening the water. Hard water also tends to produce a voluminous froth of a light and fluffy nature which is very hard to break down into the launders. On the other hand, soft water produces less froth which carries such a heavy mineral load that it automatically breaks upon dropping.

Screen Analysis of Concentrate of Difficult Ore Running 30% SiO_2

Mesh	%	Cum. %	CaF_2 %	SiO_2 %	$CaCO_3$ %
100	8.0	8.0	95.6	3.9	0.32
150	10.0	18.0	96.0	3.4	0.40
200	38.8	56.8	96.5	2.9	0.48
−200	43.0	99.8	97.8	0.6	0.80

Results of Week's Operation With Starch Prepared with Na_2CO_3

Product	% Wt.	$\%CaF_2$	$\%SiO_2$	$\%CaCO_3$	$\%R_2O_3$	Recovery % CaF_2	Recovery % SiO_2	Recovery % $CaCO_2$	Recovery % R_2O_3
Mill head	100.0	69.80	25.20	2.60	2.5				
Concentrate	60.0	97.96	1.24	0.58	0.3	86.2	2.9	13.4	7.2
Tail	40.0	24.40	63.30	6.10	6.0				
Comb, cleaner tail		80.70	14.30	2.50	2.6				

2. A close operation control must be maintained over the mill at all times. Pulp density in the first rougher cells should be kept above 25 percent solids. If the density is allowed to drop below this, the reagent consumption increases materially, and the froth begins to drop its load and assumes an undesirable "weepy" characteristic. It has been found also that sufficient water must be added to the cleaner cells to keep the density below 35 percent solids. Higher density was observed to cause very heavy and stiff froth. An extreme condition of this kind may cause the froth to disappear.

3. Desliming of the feed prior to flotation is not always necessary if a suitable slime flocculating reagent, such as starch, is properly used. Starch prepared with caustic soda was found to be stable under ordinary conditions, easy to prepare, and easy to feed.

4. When employing quebracho as a calcite depressor, a careful ratio must be maintained between this reagent and the oleic acid used. An excessively high quebracho-oleic acid ratio may cause a high tailing loss, while a ratio too low may result in a low-grade concentrate. The correct ratio for any particular ore probably is best determined by experimentation, and when found should be rigidly adhered to.

I wish to express my appreciation to Joseph Fischer, president, and Lou Adler, mill superintendent, for their assistance in preparing this article.

Platinum Minerals Identified in Western Alunite

SAMUEL H. CRESS and CYRUS FELDMAN, *U. S. Geological Survey, Washington, D. C.*

IN THE COURSE of an examination of alunite from different deposits in the Western States now being made by the U. S. Geological Survey, traces of platinum metals have been identified in several samples. Alunite is a basic sulphate of potassium and aluminum, generally considered a possible source of aluminum or potash or both. Platinum metals have not hitherto been identified in alunite, although they have been found in jarosite, a related iron sulphate mineral. At the Boss mine, in southern Nevada, palladium, platinum and gold were discovered in association with plumbojarosite in 1944 and argentojarosite has been described from the Tintic Standard mine.

The platinum metals in alunite were first detected chemically and further identified spectrographically. A lens of schist in alunite from Sugar Loaf Peak, Yuma County, Arizona, collected by L. S. Gardner, of the Survey, assayed 1 oz. of platinum per ton, with traces of palladium and rhodium. A sample of alunite from the other side of the peak showed a trace of platinum. Alunite from the top of Marble Mountain, Rio Grande County, Colorado, yielded 1.4 oz. per ton of silver and a trace of platinum. A sample from the West Hill showed a trace of rhodium. The platinum metals are apparently present in an oxidized form, as no metallic flakes could be identified, and the metals were detected only on concentration by assaying or chemical treatment. Not enough determinations have been made to give any idea of the possible commercial extent of this source of the metals. Rhodium is three times as valuable as platinum.

Although all alunites do not necessarily contain platinum, the association of these metals with alunite is of scientific if not of commercial interest, as it suggests that the platinum metals may be deposited by hydrothermal solutions under near-surface conditions. Whatever their origin, further tests of alunite deposits for the platinum metals seem desirable. Incidentally, the spectrograph has shown traces of rubidium in a few samples and traces of gallium in nearly all the samples of alunite so far examined.

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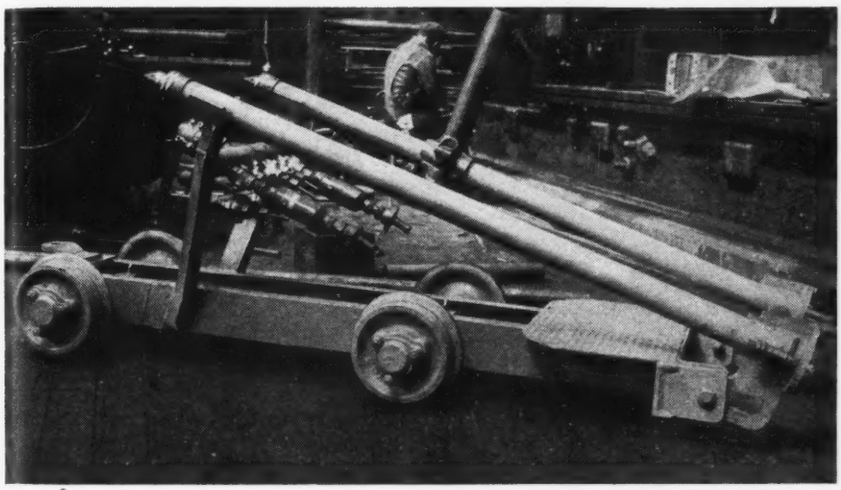
OPERATING IDEAS

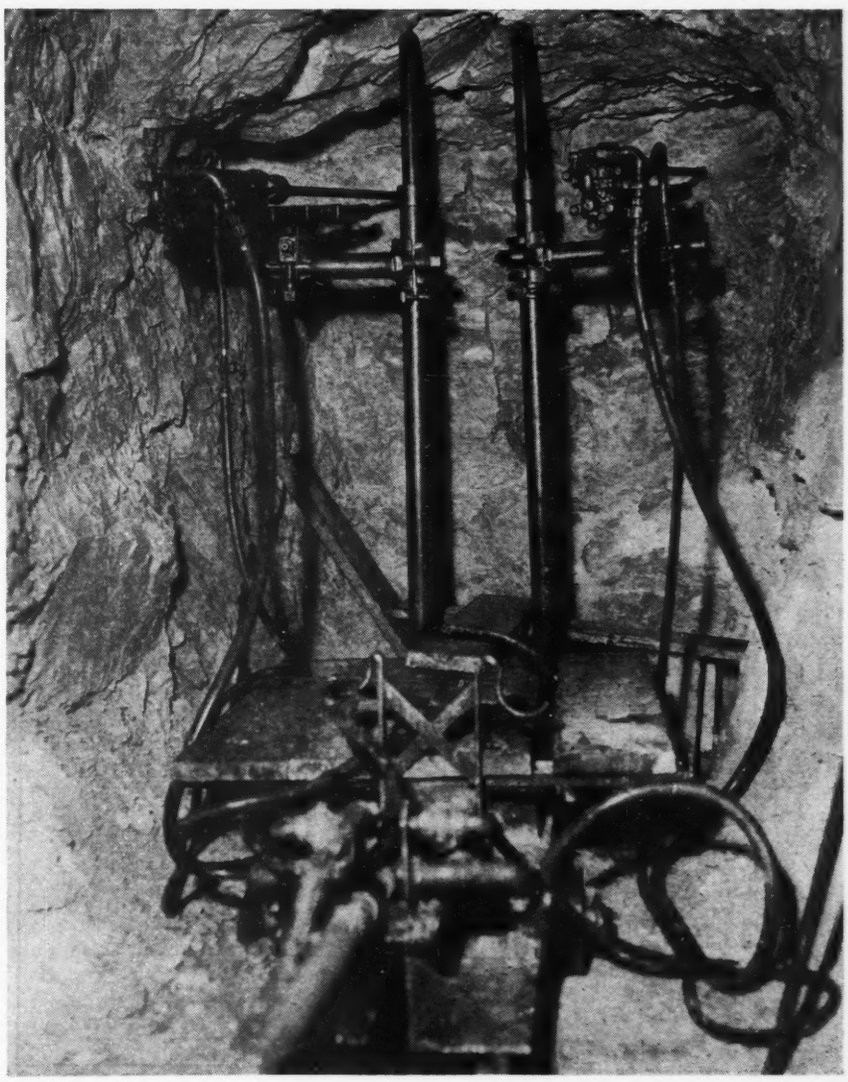
Jumbo Drill Carriage That Gets Into Action Fast



little more room on a switch than a conventional mine car.

The drill carriage consists essentially of a four-wheel truck made from channel irons, a steel saddle, containing the air and water connections and holders for the tool columns, and two air-operated, pivoted tool columns at one end. Operation is relatively simple. Upon arrival at the drift face, the two tool columns lying on the drill carriage are raised to a vertical position, the extensions securing them quickly and accurately after opening the air valves. The device can be used for driving drifts up to 10 ft. wide and 10 ft. high, for drilling bottom of ditches, starting raises, and for side-swiping.

Up to 1½ hours of drilling time per shift has been saved at Bunker Hill by using this rig. Drill columns are shown lowered for transport, above, and set up ready for drilling (a ten-minute job), at right

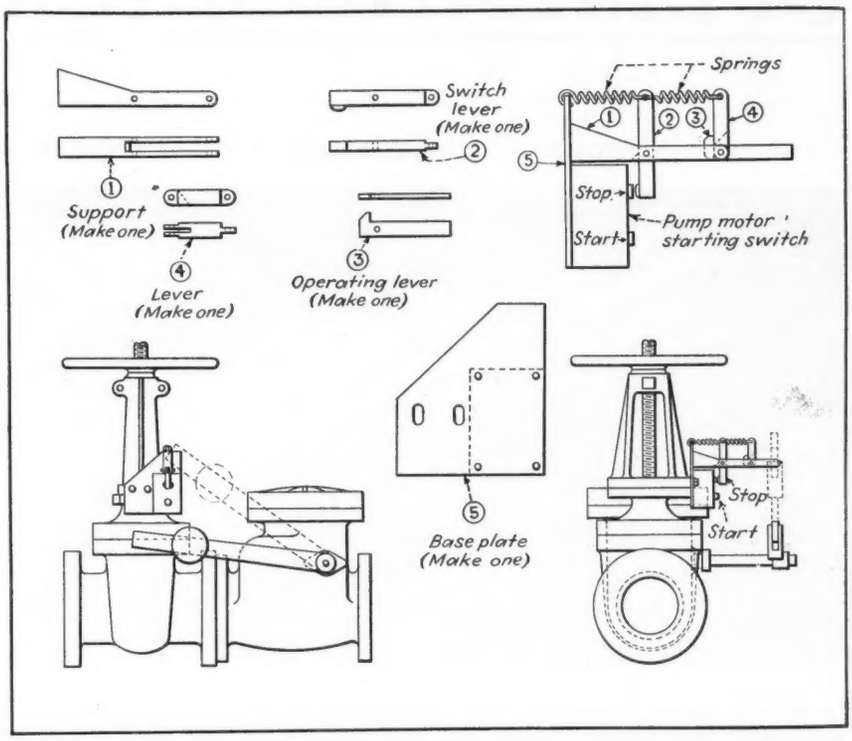


IN DRIVING any drift or tunnel, especially where mechanical shovels are used, it is important to employ a drill carriage which permits operation soon after the heading is mucked out. Ability to set up the drills with a minimum delay automatically reduces the time required for the complete blasting cycle.

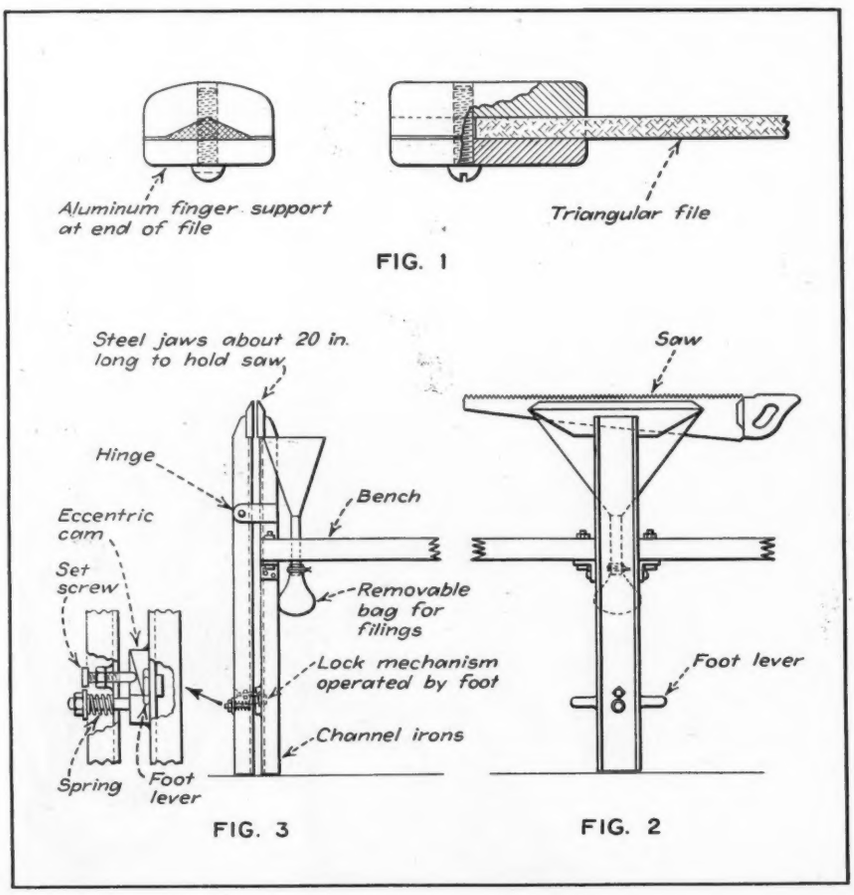
A unit that fully meets this requirement and one that has given excellent service underground at the property of Bunker Hill and Sullivan Mining and Concentrating Co., Kellogg, Idaho, is the jumbo, shown in the accompanying photographs, developed and patented recently by Stanley W. McDougall, mine superintendent. It is claimed that drilling operations can be started at from five to ten minutes after arrival of the carriage at the tunnel or drift face, and as a result time savings up to 1½ hours per shift have been effected. Outstanding features incorporated in the design of the jumbo are simplicity, compactness, sturdiness, flexibility, and use of pivoted, pneumatically-operated tool columns. It will carry two drifters, is not overly heavy or cumbersome, and requires

Mechanical Device Stops Pump in Event of Line Failure

DETAIL OF THE construction of a pump control arrangement that automatically stops the pump in the event of pipe line or a pump failure is shown in the accompanying line drawings. It was developed at the United Verde Branch, Phelps Dodge Corp., Jerome, Ariz., and is successfully used on a large Aldrich pump installation operating on the 3,000-ft. level. Outstanding construction features include simplicity of design, dependability, positive action, and low first cost. As no use is made of relays or other electrical control units (operation is entirely mechanical), the device will work equally well in wet or damp localities. As will be seen, the operating mechanism is made up of a series of steel levers, tension springs, and a base plate. Operation is relatively simple. In the event of a breakage in the discharge line or pump failure, the counter-weighted lever on the check valve falls immediately, causing the lever mechanism to push in the stop button on the starter switch.



Faster Saw Sharpening With Foot-Controlled Vise

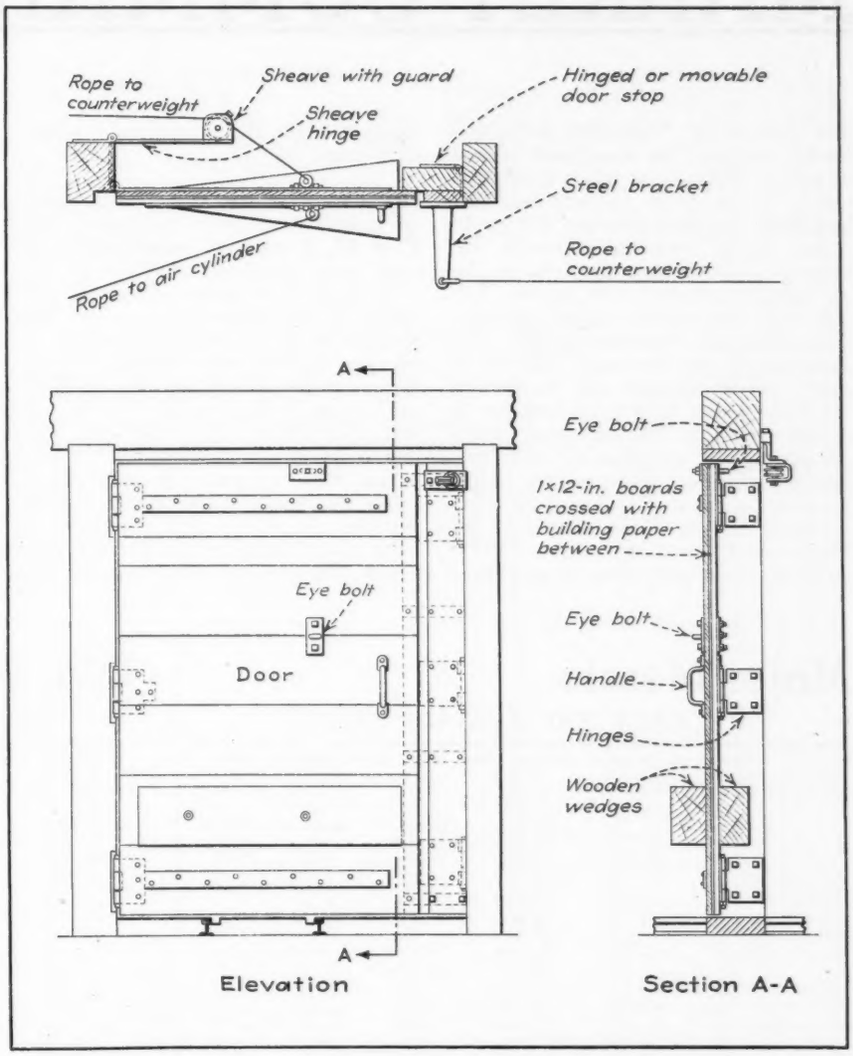


A JOB THAT never ends at the mine carpenter or timber framing shop is the reconditioning of teeth on hand saws. This is a tedious task, especially when inadequate or slow-adjusting saw holders are used. To speed up the work, Mike Amersek, an employee at the United Verde Branch, Phelps Dodge Corp., Jerome, Ariz., developed the vise and finger support shown in Figs. 1 and 2. The vise is made from two channel irons, one stationary attached by two brackets to the work bench and the other movable, with the jaws proper measuring about 20 in. The two channels are held together by a hinge or fork welded to the stationary unit a short distance below the jaw, and closing of the jaws is effected by the simple lock mechanism shown in detail in Fig. 3. It is quick acting, and consists of an eccentric cam with two extending levers or wings, and a sturdy steel setscrew. The jaws are closed by simply pressing down with the foot the right extension of the cam, while pressure on the left extension releases them. Resultant steel filings fall into a steel funnel and thence into a small canvas bag. The aluminum finger support attached to the end of the triangular file as explained in Fig. 1, obviates the use of tape or other provisional arrangements to protect the fingers.

A Safe Underground Ventilation Door

THE PROBLEM OF providing dependable and safe doors in drifts and tunnels given over to haulage operations in the ventilation system of a mine is not exactly an easy one. Primary requisites are simplicity of design, automatic or mechanical control, and dependability. Of the various designs available and in use, many have one inherent weakness —namely, they open only one way, generally in the direction of the approaching locomotive or train, and as a consequence serious crash accidents may occur in the event the automatic door control fails. In other words, no flexible or movable door stop has been incorporated in the design of the door.

This difficulty has been satisfactorily overcome in the unit developed and employed at a large copper mine in Arizona and explained in detail in the accompanying sketch. As will be seen, use is made of a simple, hinged door stop held in normal position by a counterweight. Operation is simple and positive. If for any reason the door remains shut as the locomotive approaches it and a crash is inevitable, the door stop is knocked backward at the moment of impact, thereby allowing the door proper to swing open in the opposite direction, thus clearing the way for the moving locomotive. The door is made from 1x12-in. boards crossed, with building paper between, and auxiliary parts such as hinges, counterweight rope attachments, and bumpers in the form of wooden wedges are installed as shown.



Road Maintenance Adds to Truck Tire Life

BY THE SIMPLE expedient of raking rocks out of the haulage roads in the pit, the staff of the Spruce mine of Oliver Iron Mining Co. at Eveleth, Minn., has greatly increased the life of the tires used on its fleet of Dart and Mack 30-ton trucks. Average life of the tires is about 4,000 hours, although a number of tires have been run over 5,000 hours.

This excellent record is attributed by the company in large part to the activities of a crew of men who patrol the haulage roads in the open pit armed with ordinary garden rakes with which they remove from the road every large stone they find there. The effect and the value of this procedure have been unmistakable, according to the company.

A further aid to increased tire life at the Spruce mine is the care with which the trucks are loaded. It is remembered in loading the trucks that a ton of limonite, for example, occupies 18 cu. ft., but that a ton of hard lump ore fills only 10 cu. ft. Overloading a truck greatly damages tires, and the Spruce mine trucks are therefore loaded with ore weight as the chief consideration rather than the maximum volumetric capacity of the truck.

An Industry of Ideas

***HAD IT EVER** occurred to you that this whole mining industry is built on operating ideas? The magnesium casting machine on page 98 of this issue and the saw-sharpening vise on page 108 both resulted from some man's urge to do a better job. The free flow of ideas, both large and small, is the spark-plug of our industry.*

If you have improved some machine, solved some operating difficulty, invented some little gadget to do part of your work, help your industry by passing that idea along. Send us a short description of what you did along with a sketch or a snapshot. For every item accepted, E. & M. J. pays $5. The potential value to the industry of these ideas is incalculable.

MARKET SUMMARY

THE MONTH OF NOVEMBER introduced further evidence that the period of real or possible shortages of major non-ferrous metals is coming to an end, and that henceforth increased attention will be directed toward providing materials for essential civilian needs. Cutbacks in the war program attracted wide interest. Several small-arms plants ceased operating. Three aluminum fabricating projects were abandoned during the month. Output of brass is to be curtailed after the turn of the year, freeing fairly large tonnages of copper and zinc. The emergency stockpiles, with the exception of lead, continue to grow. But even in lead the reserve is viewed as ample. The Reclamation and Inventory Branch of the Aluminum and Magnesium Division of WPB is working on a plan to stockpile secondary aluminum ingots to assure the segregation of aluminum scrap.

PRICES for non-ferrous metals, excepting quicksilver, were easily maintained. The *E. & M. J.* index of major non-ferrous metal prices continued at 88.74 for the 15th consecutive month. However, producers of quicksilver were nervous and pressure to sell increased, particularly in reference to first-quarter output. Prompt delivery metal sold in New York at $192 per flask of 76 lb., a reduction of $3 per flask. Quicksilver for delivery early next year could have been obtained at several dollars below the prompt-metal quotation. Large consumers of quicksilver indicate that they intend to restrict purchases to cover actual business on hand to eliminate all risk. The Government's quicksilver program calls for a reduction in purchases for 1944 of approximately 30 percent.

ALLOCATION OF COPPER for December uncovered little that was new. The approach of the inventory period moderated some requests for the metal, leaving an extra supply for the stockpile. The War Production Board released figures on brass mill operations. The figures revealed that output of brass and allied products for the first half of 1943 was at the rate of 470,000,000 lb. a month, against an average of 135,000,000 lb. monthly for 1940. Both new copper and scrap were used in producing the tremendous poundage of brass. So far as domestic production of copper was concerned, output has not varied much in recent months, though manpower shortages still persist in some districts.

Major Metals

U.S. DAILY AND AVERAGE PRICES

1943 Nov.	Electrolytic Copper Domestic (a) Refinery	Electrolytic Copper Export (b) Refinery	Straits Tin New York	Lead New York	Lead St. Louis	Zinc St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
5	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
12	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
19	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25	Holiday	11.700	Holiday	Holiday	Holiday	Holiday
26	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
Nov.	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR WEEK			
Nov 3	11.775	11.700	52.000	6.50	6.35	8.35
10	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
			CALENDAR WEEK AVERAGES			
Nov. 6	11,775	11,700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25

Gold, Silver, Sterling

DAILY AND AVERAGE PRICES

1943 Nov.	Sterling Exchange "Checks" (Nominal)	Sterling Exchange "90-day demand"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	401.000	(f)	44.750	23.500	168s	$35.00
2	Holiday	(f)	Holiday	23.500	168s	Holiday
3	401.000	(f)	44.750	23.500	168s	35.00
4	401.000	(f)	44.750	23.500	168s	35.00
5	401.000	(f)	44.750	23.500	168s	35.00
6	401.000	(f)	(e)	(e)	(e)	35.00
8	401.000	(f)	44.750	23.500	168s	35.00
9	401.000	(f)	44.750	23.500	168s	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	Holiday	(f)	Holiday	23.500	168s	Holiday
12	401.000	(f)	44.750	23.500	168s	35.00
13	401.000	(f)	(e)	(e)	(e)	35.00
15	401.000	(f)	44.750	23.500	168s	35.00
16	401.000	(f)	44.750	23.500	168s	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	44.750	23.500	168s	35.00
19	401.000	(f)	44.750	23.500	168s	35.00
20	401.000	(f)	(e)	(e)	(e)	35.00
22	401.000	(f)	44.750	23.500	168s	35.00
23	401.000	(f)	44.750	23.500	168s	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25	Holiday	(f)	Holiday	23.500	168s	Holiday
26	401.000	(f)	44.750	23.500	168s	35.00
27	401.000	(f)	(e)	(e)	(e)	35.00
29	401.000	(f)	44.750	23.500	168s	35.00
30	401.000	(f)	44.750	23.500	168s	35.00
			AVERAGES FOR MONTH			
Nov.	401.000	.....	44.750	23.500	....	35.00
			AVERAGES FOR WEEK			
Nov. 3	401.000	.....	44.750	.....	....	.....
10	401.000	.....	44.750	.....	....	.....
17	401.000	.....	44.750	.....	....	.....
24	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: Nov. 6th, 44.750; 13th' 44.750; 20th, 44.750; 27th, 44.750.
(e) Not quoted (Saturday), (f) No quotations.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.255c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal*'s average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1993, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout November.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

SALES OF LEAD for December shipment were in good volume, indicating to producers that consumption of the metal must be holding at between 65,000 and 70,000 tons a month. Those buyers who asked for foreign lead to supplement their purchases of domestic metal found that they had to take foreign lead at the ratio of two-thirds common to one-third corroding. Zinc supplies are increasing and the industry hopes that WPB will soon release more metal for civilian consumption. A cutback in the brass program is expected to make itself felt in zinc soon after the turn of the year. Available tonnages of zinc concentrate are still being absorbed without difficulty, but the excitement about obtaining supplies has moderated appreciably. The status of tin has changed little, owing to the fact that major producing areas are still in the hands of the Japs. Increased supplies have come from Africa, chiefly the Belgian Congo, and concentrate has been moving into the United States from Bolivia. Tin consumers look for no lifting of the controls on consumption except in minor applications deemed essential.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for February and March:

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	Oct.	Nov.
Quicksilver, N. Y. flash.	195,000	193,696
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo.	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b).	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80

	1941	1942	1943
January	82.48	85.39	88.74
February	82.76	85.90	88.74
March	83.27	85.90	88.74
April	83.48	85.90	88.74
May	83.51	85.90	88.74
June	83.48	85.90	88.74
July	83.60	85.90	88.74
August	83.39	85.90	88.74
September	83.34	88.74	88.74
October	83.84	88.74	88.74
November	84.32	88.74	88.74
December	84.42	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(Dec. 1, 1943)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$192.00@$194.00
Radium, mg. radium conten	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	(b)$100.00@$120.00
Chrome Ore, per long ton, f.o.b. cars Atl ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. MRC depot, l.t. unit	$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o b. mines	45c
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27.50c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00

Mica—Base prices on sheet, North Carolina one-half trim, as posted by the Colonial Mica Corp., the Government's buying agency for obtaining strategic mica, per pound, follow: Sheet to cut minimum of 1½ × 2 in. $2.40; 2 × 2 in. $3.52; 2 × 3 in. $4.64; 3 × 3 in. $5.12; 3 × 4 in. $6.08; 3 × 5 in. $7.04; 4 × 6 in. $8.00; 6 × 8 in. $9.12; punch, 30c. Premium and discounts up to 40 per cent, depending on quality and trim Scale does not apply to non-strategic mica

Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Metal Controls Eased But Not Abandoned

To what extent allocation (commandeering of distribution) of metals is to be given up by the War Production Board has been the subject of much speculation in Washington. Growing surpluses of some metals, particularly ferro-alloys, make possible an easing of some of the controls. A canvass of the situation reveals there will be no wholesale relinquishing of controls at this time.

Each metal will be handled on its own merits. Antimony will not be allocated after the first of the year. Copper, steel, and aluminum, the three CMP metals, will be allocated as they have been in the past. Change from a quarterly to a semi-annual, or even annual, basis of distribution is a possibility.

Tin controls will not be relaxed. Metals Reserve is the sole buyer or seller of tin that the government has allowed. Any one needing tin must apply to Metals Reserve. Lead has never been under allocation. No announcement had been made in regard to zinc up to Thanksgiving, although the possibility of taking zinc off allocation was being freely discussed. Announcements regarding other metals are expected from time to time.

Whatever action is taken regarding allocations, all control over utilization will not be thrown out. There will be the limitation orders of WPB specifying the end uses. These orders are considered sufficient control for most metals if direct allocation is abandoned.

Mine, Smelter Quotas On Semi-Annual Basis

Quotas for mines and smelters operating under Orders P-56 and P-73 have been put on a semi-annual basis. Quota certificates for the first and second quarters of 1944 were mailed with a letter to that effect. It said, "You may now also place orders for delivery for the second quarter up to the amounts of the first quarter quotas and you may take delivery on these orders in the second quarter without further application."

This action is in line with the WPB policy of cutting down on paper work both in Washington and in industry to the greatest possible extent.

Non-Serialized Mines Get Better Rating

Mines without serial numbers under Preference Rating Order P-56 will have an easier time securing maintenance, repair and operating supplies by a recent amendment to that order. The amendment gives a new rating of AA-5 to all non-serialized mines which takes the place of the A-2 rating which previously applied. This action puts the rating up to a place where it means something. The non-serialized mines should now be able to purchase their needed supplies.

The provisions continue in force that permit mines without serial numbers to make special application to secure equipment and supplies if the AA-5 rating will not get the items that are needed.

Poor Drafting Hinders Gold Mine Relief Bill

Gold mine operators need not expect much from the bill (H.R. 3682) introduced in the House to rescind WPB's Order L-208, which restricts the operation and maintenance of gold mines. Washington opinion is that it will not even get out of committee, at least without revision.

H.R. 3682 is handicapped by being poorly drafted. The bill proposes not only that L-208 be rescinded, but also that the action apply to "any other order, rule, or regulation issued by any department, agency or officer of the government which imposes restrictions similar to those imposed by such Limitation Order L-208."

If this bill should become law, some believe it would nullify the power given the President in the Second War Powers Act to delegate authority and would thus jeopardize the entire structure of the government war agencies. It also would endanger the Selective Service Act and all of the orders issued by the War Manpower Commission controlling labor movement. Thus, it is inconceivable that this bill in its present form will receive serious consideration either in or out of committee.

H.R. 3682 might be rewritten. The best that could be hoped for would be the removal of restrictions on gold mine development work and provisions that would hasten the resumption of gold mining after the war. It is doubtful that anything could be passed that would give owners of closed gold mines greater privileges than they presently enjoy under that order.

The issue is one of manpower. When surplus labor appears, there will be a basis for abandonment of L-208.

Policy for the grant of appeals under the relief clause of L-208 was established last June. At that time WPB stated that the labor had to be available without drawing from producers of war materials, and that the mine's output of critical minerals must be sufficient to justify use of the necessary labor and materials.

There has been no relaxation in the administration of L-208 before or since the announcement of this policy. In the case of mines employing fewer than seven men there has been a tendency to authorize continued operation providing the men employed cannot be used in essential war industries because of age, physical handicaps, or other reason. There has been no inclination on the part of WPB to authorize new operations.

WPB Staff Exodus Dangerous to Industry

Washington believes that it is quite likely that WPB will direct demobilization of industry when the war is over. Obviously, it is the best-equipped agency in the government to handle this gigantic task. In so doing, it is likely to depend heavily on its industry advisory committees.

There is in progress, however, a general exodus of industrial men from government posts in Washington, and many observers feel that industry is making a mistake in encouraging its executives to leave Washington prematurely. Most of these men know their way around. When the problems of contract termination and reconversion must be handled, they can be of great value both to their government and to industry as a whole. Industry will have itself to blame in part if the new crop of administrators is heavily sprinkled with witch-burners, crack-pots, and lame-duck politicians.

Tied closely to contract termination and reconversion is the problem of disposing of surplus materials. The thinking in government circles is that one established government agency should have sole responsibility for disposing of surpluses.

Army Seeks Fairness In Ending Contracts

Definite realization that victory is in the cards has caused official Washington to give more serious consideration to means of ending war contracts. Methods by which contracts should be terminated are being studied by the armed services, in WPB, on Capitol Hill, by close advisers of the President, and by some of the old line government agencies. There seems to be unanimity of views concerning what should be done. Termination of contracts should be handled with speed and finality, and be subject to review only for fraud.

In considering the problem of termination of contracts, the Army insists that emphasis is to be on fairness rather than on the best deal that can be forced by the contracting officers. It is their intention to end contracts on a reasonable basis.

In line with the idea that contracts must be terminated with speed and finality, a concrete suggestion comes from the War Department that companies with war contracts should get ready now for any eventuality. Because industrial concerns can

make or lose tremendously from the way termination is handled, it is urged that an executive committee should be set up now in each firm to gather necessary information. Decision should be made now concerning what part of the work in process the company would like to keep and what they're willing to offer for it. An inventory of the tools and dies that the company would like to keep and those to be disposed of should be made. The amount to be offered for those to be kept should be determined at once. Army procurement officers also suggest that raw materials and equipment should be kept out of government hands as much as possible. This is not official policy—merely individual thinking out loud.

In this connection, the policy of the Army in cutting back production will be of interest. If there are a number of manufacturers making the same item, and the present requirements can be satisfied by the production of only a few of the manufacturers, the cutback will not be proportionate for all contractors. The contracts of the less efficient producers, based on man hours, will be terminated. The Army has comparative cost figures.

It is believed that a far-sighted viewpoint will regard this policy as beneficial to business. During the war, the general tendency has been to allow inefficiency to creep into industrial production. By the elimination of inefficient producers, industry will be reconditioned for the highly competitive market conditions that will be met in the postwar period. Some producers are going to be released from war contracts within the next few months, which will give an opportunity to see how this policy works out.

Mining Tax Problems Are Recognized

The bills introduced in the House by Representative Disney and in the Senate by Senator Scrugham "to extend excess profits tax exemptions relating to strategic minerals to income attributable to the mining of fluorspar and the production of hydrofluoric acid" have served their purpose. The same is true of H.R. 3267, which undertook to provide percentage depletion for beryl, feldspar, flake graphite, lepidolite, mica, potash, spodumene, and vermiculite. These bills were introduced to be sure that the committees handling the new revenue bill would consider these ideas while framing new tax legislation. The Revenue Act of 1943, which has been passed by the House and at the last of November was in the hands of the Senate Finance Committee, contains provisions similar to these bills.

However, in its present form the bill also contains an amendment which would limit percentage depletion for the abovementioned minerals, plus the newcomers written into the 1942 Revenue Act (fluorspar, ball and sagger clay, and rock asphalt), to the war period. This seems like a peculiar restriction, as it implys that percentage depletion is a bonus rather than treatment which merely recognizes conditions inherent in mining operations. It indicates that there is still much work to be done in making Congress realize the enormity and riskiness of the task of finding and developing minerals.

Leadville Tunnel Contract Is Awarded

After considerable delay, a contract has finally been awarded for driving the Leadville drainage tunnel (E & M J, Sept. p. 68). The news came as something of a surprise, as Washington observers had just about concluded that the project had become such a political football that it would never be driven.

The Leadville project was authorized by Congress as an insurance measure against the uncertainties of future zinc production. However, since passage of the bill, which delegated execution of the project to the Interior Department, Secretary Ickes has developed an extraordinary passion for economy in government. In his zeal to protect the long-forgotten taxpayers, he has been holding up the work in order to explore possibilities of making the project self liquidating. This concern seemed rather superfluous, inasmuch as Congress had considered the problem of self liquidation, and concurred with WPB, RFC, and Bureau of Mines officials that the same was infeasible in view of the urgency of completing the project as soon as possible.

In order to fulfill the Secretary's desire, the Interior Department has "invited" the mine and claim owners to agree to pay royalties to the government in case of production. Overhanging the "invitation" is a thinly veiled threat to sue under Colorado law in cases of noncompliance (See p. 114).

The basis for these mancuvers is an opinion rendered by the Comptroller General that "it is not apparent that the Government would acquire such a substantive right . . . to entitle it to reimbursement from the private parties benefited" but going on to recommend that collection be attempted on the basis of coming "within the general intent, if not strictly within the letter, of the State statutes involved."

Liberal Treatment in Limiting Premiums

The mid-November announcement explaining the term "mines already operating" as used in the WPB policy statement of Oct. (E & M J, Nov. p. 129), is a victory for the forces standing for honesty and fair dealing in the government. Hardly had the Oct. 27 policy statement been published when the argument began as to what was an operating mine. Government men adhered to one of two definitions of the term. One side adhered to the literal interpretation of the word "operating," meaning actual production of ore. The other side contended that the restriction on premium payments "does not apply to any mine which was producing, developing or otherwise working prior to Oct. 27." The latter won.

This means that the operator who listened to Washington's plea for more metal, and without further question went out and got a marginal property going, will be given a chance to work his way out. WPB has explained that the term "mines not already operating" as used in the statement of October 27, 1943, means mines which began work after that date. "All applications received from such mines will, under current policy, be considered on their own merits until further notice." This is in regard to the establishment of B and C quotas for zinc producers and B quotas for lead producers.

In the case of copper, the special copper premium prices established under the plan which became effective the first of May will not be available for new operations after Dec. 31, 1943. This ruling, made Nov. 9 will not affect applications filed before Dec. 31, 1943.

Although WPB officials have sought to reassure operators enjoying B and C premiums, the fact remains that long continuance of these premiums can scarcely avoid criticism if surpluses of metal or concentrates continue to pile up. If developments permit the relaxation of limitation orders in order to start on the gigantic task of reconversion to peacetime production, WPB will be in an embarrassing position. Congress is bound to question the spending of government funds for high premiums on production that is being released for not absolutely essential civilian requirements.

May Kill Subsidy in Stockpile Program

The minerals stockpile bill, introduced by Senator Scrugham of Nevada and Congressman Murdock of Arizona, has been hanging fire for several weeks, presumably because its sponsors have been unable to marshal sufficient support to warrant bringing the issue to the floor. However, in recent weeks there has been evidence of growing interest in stockpiling on the part of the Administration. Being under greater and greater fire over the onesidedness of the flow of lend-lease materials, and with doubts arising over the capacity or willingness of the beneficiaries to make repayment, the White House sees stockpiling of minerals as one means of relief from an embarrassing situation. Repayment in raw materials would be much easier than to pay cash, particularly if prices decline from wartime levels. To stockpile the materials thus received in payment would avert much of the howl that would arise among domestic producers if such shipments should be thrown into domestic markets. Thus, the stockpiling program is likely to receive Administration backing, but only at the price of cancelling the provision in the present bill that would require paying domestic producers a 25 percent subsidy over the market before purchasing minerals from foreign sources. Even with this provision deleted, passage of the stockpile bill would do much to relieve the mining industry of the avalanche of metals in various forms which now threatens its postwar markets.

NEWS OF THE INDUSTRY

Leadville Tunnel Contract Signed

Signing of a government contract for driving the 17,300-ft. Leadville, Colo., drainage tunnel (*E. & M. J.*, Sept., 1943) was announced on Dec. 5 by the Department of the Interior. The cost plus fixed-fee of 4½ percent contract authorizes Stiers Brothers Construction Co., whose crews headed by John Austin have driven many Colorado railroad, mining, and drainage tunnels, to begin work within 30 days.

Built and owned by the U. S. Bureau of Mines, the tunnel will be completed in an estimated 555 days and will give access to about 3,000,000 tons of zinc and lead ores and 1,000,000 tons of manganese ores. A sum of $1,400,000 was appropriated by Congress to the Bureau of Mines to cover the tunnel's cost, and a thorough investigation of all geological, legal, and social aspects of the project was completed before the contract was signed. With regard to protecting the government's investment in the tunnel, Secretary of the Interior Ickes consulted the Comptroller General and the Attorney General and had the following to report:

"In view of this counsel, I have decided that the government has two methods of obtaining payment on an equitable basis from property owners who will benefit from the drainage tunnel and laterals," Ickes said. "One is by payment of royalties on a voluntary basis; the other is by collection through the courts under Colorado law. The Department of the Interior favors the royalty plan and intends to use that wherever possible."

Secretary Ickes apparently referred to Sections 207-215, Volume IV, 1935, of the Colorado Statutes, Annotated, which cover distribution of drainage expense of a group of mines situated as are those in the Leadville district.

The Department of the Interior has invited all property owners of the flooded region in Leadville to execute agreements which exempt signers from statutory liability for construction charges and assure them the right to use the tunnel system for prospecting and other purposes as well as drainage. The agreements also stipulate payment of a royalty by property owners of not less than 2 percent and not more than 4 percent on the smelter or mill returns from minerals taken from areas higher than the tunnel level, and not less than 1 percent nor more than 2 percent on the smelter or mill returns on minerals mined below the tunnel level.

Antimony Supplies Far Exceed Demand

Antimony supplies are so far in excess of current and anticipated demands, according to E. Vogelsang, presiding officer of the Antimony Industry Advisory Committee, that a relaxation in regulations governing use of the metal is warranted. It was suggested by the tin-lead division of the WPB that this might take the form of eliminating allocation requirements and use restrictions of the metal from WPB Order M-112. WPB officials indicated, however, that no change in present regulations will be made before 1944, at the earliest.

At a recent meeting of his committee, Mr. Vogelsang presented the following analysis of the antimony situation for this year and next:

Antimony—Supply and Demand

	Contained Antimony (short tons) 1943	1944
Stocks		
Government, ore	1,384	14,800
Government, metal	11,279	13,000
Private, ore	4,789	4,500
Private, metal	4,614	3,790
Imports		
Mexico	13,200	12,000
South America, etc	19,500	1,250
Domestic production	5,124	4,000
Secondary production	18,000	12,000
Total supply	77,890	65,340
Demand		
Domestic, primary	23,500	24,000
Domestic, secondary	18,000	12,000
Export	300	500
Total demand	41,800	36,500
Reserve supply, Dec. 31	36,090	28,840

It will be noted on examining these figures that the largest drop in production for next year is slated for South America, which is expected to produce in 1944 only 1,250 tons against 19,500 tons this year. Mexico's production will drop only 1,200 tons, and domestic production will be down 1,124 tons.

First Metal Released For Civilian Use

Civilian repair shops will get steel, copper, and aluminum, as well as other needed materials and parts, under a new CMP order, No. 9A, issued on Nov. 26 by the Office of Civilian Requirements. The order reflects the generally improved metal supply situation, particularly with regard to copper wire.

Electricians, plumbers, blacksmiths, radio repairmen, and others engaged in any kind of repair work may now buy in any one quarter up to 20 tons of carbon and alloy steel, 500 lb. of copper and brass products, and 200 lb. of aluminum in certain forms. Electricians, contractors, and electrical repairmen may buy up to $150 worth of copper wire or one-eighth of their 1941 purchases of wire, whichever is the greater.

Special provision is made in the order for firms specializing in industrial repair work. These companies may obtain greater quantities of metal by obtaining a special authorization, including a priority rating of AA-2, from the WPB in Washington.

U.S.B.M. Discovers New Idaho Orebody

Exploratory work by the U. S. Bureau of Mines has uncovered a copper-cobalt-gold orebody of more than 200,000 tons in the Blackbird district of Lemhi County in Idaho, and a further search now underway may disclose the largest reserves of cobalt ore in the United States, according to a recent announcement of the Department of the Interior.

Work on the orebody was directed by S. H. Lorain, district engineer at Moscow, Idaho, and J. A. Herdlick, resident engineer, at Forney, Idaho. Old workings at the two principal mines in the area were rehabilitated, examined, and sampled. Surface trenches were dug with a bulldozer in order to permit channel sampling. Ore dressing tests conducted on these samples indicated that a bulk flotation, or selective flotation and tabling, would give satisfactory recovery of the metallic minerals.

While the Bureau continues its exploration of the district, Howe Sound Co. is reported to have obtained options on the principal claims explored by the Bureau in its early work, and is said to be carrying on a diamond-drilling program to locate additional reserves.

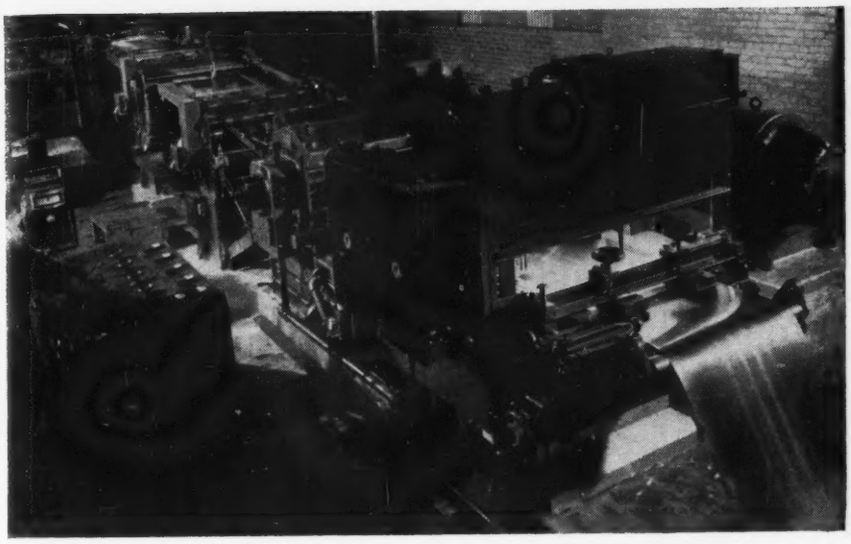
E & M J Index Now Ready

As previously announced, wartime restrictions on use of paper have made it impossible to follow the customary practice of binding the annual index in this number of the Journal. An index will, however, be sent gratis to each subscriber requesting a copy. If you want one, and have not already so indicated, send your name and address to the editor.

Aluminum Program Suffers Cutbacks

Excess of aluminum supply over demand has been hinted for some time, but early in November A. H. Bunker, director of the WPB aluminum-magnesium division, confirmed the existence of this unbalance by stating that aluminum supplies for the fourth quarter of 1943 amount to 871,200,000 lb. against requirements of only 774,000,000 lb.

Scrap aluminum, Mr. Bunker said, is now available for resmelting at a rate of 700,000,000 lb. per year, and Russia has agreed to take one-third of its fourth quarter requirements of aluminum in the form of scrap. As a result of the improved supply situation, the WPB last month issued an order permitting use of aluminum for cer-



ELECTROLYTIC TIN PLATING depends for its success on induction heating to smooth deposited tin and on an electronic eye (right) which scans the surface of the passing strip, detects pin-holes, operates controls to cut out and discard imperfect plate

tain hitherto prohibited uses to relieve the strain on scarcer metals.

More directly affecting the mining industry, however, was WPB's decision to cut production of bauxite at the three major producing centers in Arkansas. These are plants owned or operated by Aluminum Co. of America. In addition, the WPB halted construction on, or cancelled contracts to build, three large aluminum fabricating plants. These were: a $20,000,000 extrusion plant of Reynolds Metals Co., Memphis, Tenn.; a $17,000,000 extrusion plant of American Brass Co., Columbus, Neb.; and a fabricating plant of Phelps-Dodge Copper Products Corp., Hammond, Ind. Abandonment of plans for these three plants, it was reported, was caused by the Army's downward revision of its estimated aluminum requirements.

Western Mining Men Plan Joint Meeting

A joint meeting of the Western Division of the American Mining Congress and the Colorado Mining Association will be held in Denver, Colo., on January 27, 28, and 29. There will be no meeting of the entire Mining Congress as a group this winter.

Wartime problems of the mining industry will be discussed at the meeting and conferences will be held with officials of the various government agencies connected with mining activities, and with Congressional representatives of the mining states. Current policies of the WPB, anticipated requirements for various metals, metal prices and quotas, manpower, supplies, machinery and equipment, monetary problems, stockpiling legislation, mine taxation, all will be featured prominently in the several sessions.

The Colorado Mining Association, as host to the conference, is merging its traditional meeting with that of the conference in order to give Western mining men an opportunity to gather to consider their special problems.

Extra Copper Premium Ends This Year

The WPB announced on Nov. 9 that it has advised the Quota Committee for the Premium Price Plan not to accept any applications postmarked after Dec. 31, 1943, for Special Copper Premium Prices under the plan in effect since May 1, 1943. This ruling will not affect applications filed before Dec. 31, 1943, and these will be considered on their merits as heretofore. The 5 percent premium for overquota production will still be paid, however.

This limitation on the consideration of applications for Special Copper Premium Prices is due to the success of efforts to balance copper supply with the requirements of the armed services and the most essential civilian uses.

Army-Navy "E" To Two Mining Companies

The Josephtown, Pa., zinc smelter of St. Joseph Lead Co. and the Austin, Tex., magnesium plant of International Minerals & Chemical Corp. were given the Army-Navy "E" during November by order of the War Department, acting on the recommendation of the WPB.

The St. Joseph Lead Co. award was made on Nov. 9 by Major General W. N. Porter, U. S. A., chief of the chemical warfare services; it was accepted for the company by Clinton H. Crane, president. The actual "E" emblems and pins were presented to Mr. Crane and other members of the St. Joe personnel by Admiral Harry E. Yarnell, U. S. N. (Retired), of the office of the chief of naval operations.

International Minerals & Chemical Corp. was scheduled to receive the award on Nov. 30 at Austin, Tex., where the company operates a magnesium plant. Commander W. P. Kellogg, U. S. N. R., of Houston, was to present the "E" and William B. Leach, plant production manager for International, was to accept the award on behalf of the company.

Union Demands Heard in Utah Wage Talks

In hearings held before the Nonferrous Metals Commission of the War Labor Board beginning Nov. 9, arguments for wage increases, said to be the only effective means of holding miners at their jobs, were presented by representatives of the Mine, Mill and Smelter Workers Union (CIO). The decision reached as a result of these hearings will affect 23 local unions in 16 companies in Utah, Nevada, and Idaho. Charles A. Graham, Commission chairman, presided.

Demands presented by the union included: wage increases ranging from $1.30 to $2.30 per day; provision for a union, rather than a "maintenance of membership," shop; 5 and 10 percent premiums for afternoon and night shifts; seven days sick leave annually; elimination of X-ray and medical examinations as a condition of employment.

Special requests included: demand for collar-to-collar pay at the Mountain City Copper mine in Nevada and the Triumph mine in Idaho, following the procedure established by law in Utah; strict seniority promotions to be provided for by adjustments in the contract with U. S. S. R. & M. Co.; and adjustments in the contractural provisions regarding rights of employees at the Midvale smelter.

The proposed wage program asked for an increase of $2.30 daily for miners to bring them to $9.75 a day; an increase of $1.30 was asked for mechanics, and $1.80 for muckers and $1.30 for common labor to bring the last two to $8.75 and $7.75 respectively. An increase of $1.60 was asked for various classifications of operating smelter workers.

In presenting the union's position on wages, Ralph H. Rasmussen, vice-president, said, "Our union would be derelict in its duty at this time if it did not propose wage scales for this industry which would hold the workers we now have and at the same time attract additional workers." He added that the union realized that its demands were in excess of the increases possible under the Little Steel formula, but that the union no longer felt bound by that formula because it believed Congress had failed to hold prices down. Rasmussen also warned against acceptance of what he called over-optimistic statements regarding current needs for nonferrous metals.

Mine operators termed most of the demands fantastic, and held that the provisions of the country's stabilization program rule out any large wage increases. They also stated that increases could not

be justified under the cost-of-living or comparative wage theories, and that the mining industry already has the highest wage level in the area, with the single exception of the construction industry which is devoted largely to government work on a cost plus basis.

James W. Wade, president and general manager of Tintic Standard Mining Co., told the Commission that if the Little Steel formula were adhered to, miners would now be getting $7.32 per day rather than $7.45, the amount now paid them. He added that the proposed $2.30 increase plus additional taxes and smelter costs would increase mining costs by $4.59 per ton of ore. E. H. Snyder, president and general manager of Combined Metals Reduction Co., expressed the belief that wage increases would have little effect on the manpower problem in the mines. He pointed out that both labor turnover and absenteeism have more than doubled since previously existing wage levels have been pushed up by the war.

William J. O'Connor, manager of the Utah department of A. S. & R., submitted average wage rates at the Garfield smelter showing earnings of $124.76 monthly in 1940 for a 40 hour week and $188.89 for the same period in Sept., 1943. Adding overtime and vacation allowances, the comparative figures were $129.77 for 1940 and $219.17 for 1943.

The Commission gave the union ten days in which to file detailed information, and also gave the operators ten days to study the schedules and file any comments they might care to make. Final ruling has been deferred on the union's request that decision be postponed until a series of cases originating in Montana, New Mexico, Colorado, and other states can be heard. The operators had asked for a speedy decision, inasmuch as the companies concerned must now operate under a contingent liability of unknown amount until the wage issue is settled.

U.S.B.M. Explores Texas Mineral Areas

Possibilities of Texas as a mineral producing state were discussed by A. B. Needham, district engineer of the U. S. Bureau of Mines, at a meeting held last month in Austin, Tex., of the Texas Academy of Sciences and the local section of the A. I. M. E. Mr. Needham mentioned specifically the Bureau's work in exploring six areas which promise to be potential sources of iron ore, pig iron, strontium, mercury, zinc, and fluorspar.

Bureau projects now under way in Texas include: tests for production of sponge iron from a deposit in the Longview section of East Texas; production of pig iron and steel from new plants near Daingerfield; exploration of celestite deposits in Nolan County, and of mercury deposits at Terlingua on the Rio Grande in West Texas; drilling of zinc deposits in Hudspeth County, West Texas; and exploration of fluorspar deposits near Van Horn. Additional surveys are planned for East Texas iron ores, mica deposits near Van Horn, and iron orebodies in the Llano region of Central Texas.

Mr. Needham praised the University of Texas Bureau of Economic Geology for its surveys of the State's mineral resources, which had been of great assistance in the work of the Bureau of Mines. E. H. Sellards, director of the Bureau of Economic Geology, reported that his department is now preparing a new mineral locality map of Texas.

Senate Bill Would Aid Tunnel Claims

Exemption of the work now required on tunnel site claims is the object of a bill introduced in the Senate recently by Senators James E. Murray of Montana and James G. Scrugham of Nevada. This action was taken by the Senators in an effort to make more equitable the law granting a moratorium on assessment work to the extent of $100.00 yearly in the case of unpatented claims.

A Supreme Court ruling has held that tunnel sites do not fall within the category of unpatented claims. A tunnel site is regarded as a mining location, not necessarily containing mineral, which can be used as a location for driving a working tunnel to intersect mineral-bearing veins. The Murray-Scrugham bill is intended to remedy the oversight in the present law in not providing for tunnel sites.

Homestake Gold Mine Reports Year's Profit

Although mine operations were terminated in June, 1943, in compliance with the WPB gold mine closing order, Homestake Mining Co., Lead, S. D., was able to pay a dividend of 15c. a share out of profits derived from operations up to that time, according to an announcement of Guy N. Bjorge, general manager. Net profit for 1943 has been estimated at $304,000, in contrast to a profit of $5,682,999 for 1941, which is the last full year in which the mine was operated at capacity. Net return from sales of gold was $1,504,043 in 1943, but because operations ended in June, $1,200,000 for depreciation, property taxes, and maintenance costs for the entire year was deducted.

The WPB order closing the gold mines came in October, 1942, but Homestake continued operations on a reduced basis in order to complete milling ore already broken. When this ore was completely milled in June, the mine was shut down. According to the South Dakota state treasurer's office the average value of ore milled during the second quarter of 1943 was $22.43 per ton. The average value of ore milled during the last quarter of 1942 was $13.24.

The company still employs about 800 men in maintenance work, in essential jobs in the foundry in Lead, and in the lumber mill at Spearfish, S. D. The rest of Homestake's 2000 former employees have found employment elsewhere or have entered the armed forces. Many of these men, however, have left their families in Lead for the duration, which indicates that they intend to return as soon as the mine reopens. Lead is not yet a ghost town by any means.

The South Dakota state treasury, as well as the mine's stockholders, has felt the result of the mine's closing. Ore tax payments to the state by Homestake this year amounted to only $98,929, compared with $1,200,000 in 1941. This source of revenue will, of course, be absent altogether next year unless the mine reopens meanwhile.

With the mine closed, Homestake Mining Co. is producing strategic minerals in the Black Hills, in Wyoming, and in Lower California. These operations include ores of tungsten, vanadium, and manganese, respectively.

Shattuck Denn Now Producing Fluorspar

Ownership and management of Zuni Milling Co., fluorspar producer near Grant, N. M., have been taken over by Shattuck Denn Mining Corp., of Bisbee, Ariz. J. A. Wilcox of Bisbee is to be manager at the property, and George A. Warner, of Hayden, Ariz., will be mine superintendent.

The mine, which has employed 100 men in the past, is opened by two 300-ft. shafts. Ore from the mine will be treated in a jig mill at Grant, which will produce metallurgical grade fluorspar, and in a flotation mill at Las Lunas, N. M., where acid grade spar will be produced. The latter mill was built by Defense Plant Corp. and leased to Zuni Milling Co. Output of both plants goes to Metals Reserve Co.

Shattuck Denn also operates the Denn mine at Bisbee, the Iron King lead-zinc mine near Humboldt, Ariz., and custom lead and zinc mills at Bisbee.

U.S.B.M. Explores Iron Deposits

A survey to determine the extent and grade of North Carolina iron ore deposits was begun by the U. S. Bureau of Mines on Nov. 9 when drills were put to work on a deposit in Lincoln County. A few days later, drilling was started at the abandoned Cranberry mine in Avery County. Both operations are part of a program included in the $340,000 appropriation made by Congress last June to finance follow-up work on the survey made for the State by H. A. Brassert Co. of New York.

Arrangements for the Bureau's survey were made by Harry Ewolt, district engineer of the Bureau, and Paul Tyler of College Park, Md., who is in charge of all Bureau drilling operations in the eastern part of the country. The work in Lincoln County follows magnetic surveys made by the Brassert company which indicated the presence of substantial tonnages of iron ore and the work at the Cranberry mine is to determine the extent of the ore remaining. This mine was worked from 1884 to 1925, and is said to have produced more than 1,200,000 tons of ore low in phosphorus.

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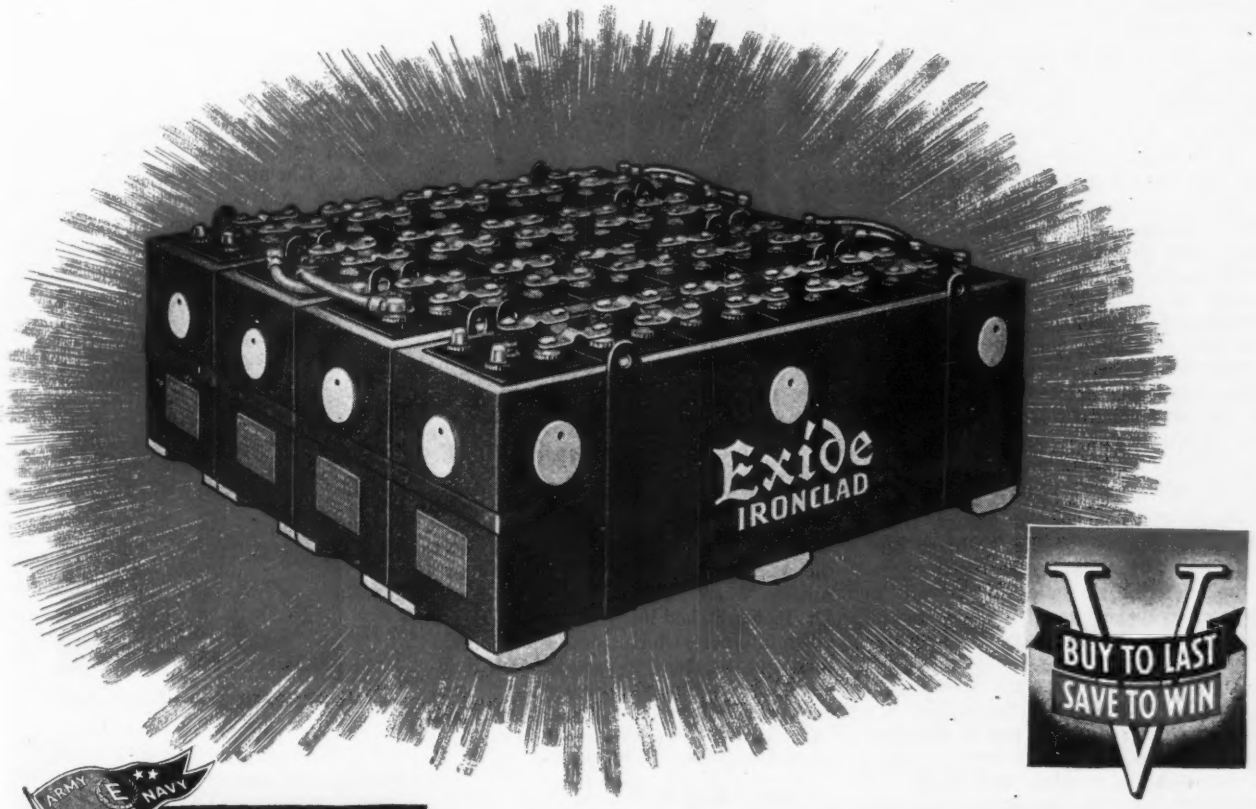

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PERSONAL NEWS

Roy A. Hunt, president of the Aluminum Co. of America, Pittsburgh, and **Dr. Zay Jeffries,** technical director, lamp department, General Electric Co., Cleveland, were honored at the recent annual dinner of the American Society for Metals in Chicago. Mr. Hunt was awarded the A.S.M. Medal for the Advancement of Research. Under the guidance of Mr. Hunt, the Aluminum Company has been a leader in the research and technical development of a metal which has had its entire industrial growth in the past fifty-five years. By consistently sponsoring research and development, Mr. Hunt has helped substantially to advance the arts and sciences relating to metals. Dr. Jeffries received the gold medal of the American Society for Metals as a recognition of his outstanding metallurgical knowledge and of his great versatility in the application of science to the metal industry.

F. W. Snow, mine manager at the Bousquet Township property of Mic Mac Mines Ltd., located 25 miles east of Noranda, Que., has become president and general manager of the Vermont Copper Company, South Strafford, Vermont. He left Rouyn Nov. 8 to take over the new responsibilities. **A. K. Kirkland,** formerly mine superintendent at Mic Mac, has been advanced to manager. The Vermont property has been developed to a depth of 800 ft. and is equipped with a 600-ton mill.

N. S. Wagner, field geologist, at Baker, for the Oregon Department of Mineral Industries, has made a report on the antimony prospects in the State. He has spent time also studying base metal properties in the Blue Mountains and optical calcite in Malheur County. **Ray C. Treasher,** field geologist, at Grants Pass, has been examining quicksilver, antimony, copper, and other strategic-mineral properties, and has completed a geological map of the southwestern quarter of the State. Dr. Wallace Lowry, assistant geologist, has reported on vanadium in Coos County and on optical calcite in southeast Oregon.

Joseph C. Arundale, of Miami, Okla., former statistician for the Tri-State Zinc and Lead Ore Producers Association, returned to the Tri-State district late in October to make himself available for induction into the armed services, following his resignation as deputy chief of the metals section of the WPB mining division. Mr. Arundale left the district two years ago to accept a position in the mining branch of OPM. He was in charge of priorities on supplies and equipment requirements for the mining industry, particularly in respect to their allocation in the Tri-State.

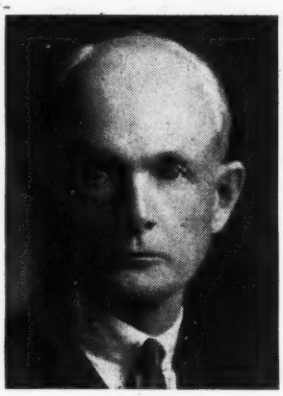
C. E. Craven, senior engineer, R.F.C., at Marshfield, Oregon, has resigned to accept the position of manager of the Washington mine of Cia. Industrial de Ballaza S. A., Huepec, Sonora, Mexico.

Harry Hey, chief metallurgist to Electrolytic Zinc Co. of Australasia Ltd. for a number of years, has been appointed technical superintendent. Mr. Hey is also president of the Australasian Institute of Mining and Metallurgy.

F. F. Espie, recently general manager of Burma Corporation Ltd. Namtu, Burma, until the invasion of the country by the Japanese, is now superintendent of Western Mining Corporation Ltd., Western Australia.

L. G. Wilkins, metallurgist to North Broken Hill Ltd., Broken Hill, New South Wales, since 1938, has retired from that position.

Dr. H. Foster Bain is among the civilians formerly interned at Santo Tomas University, in Manila, P. I., who recently returned to the United States on "S.S. Gripsholm," reaching New York, Dec. 2. Caught in December, 1941, by the Japanese invasion of the Philippines, where he had been engaged as adviser to the Commonwealth Bureau of Mines, Dr. Bain was in the Islands up to the departure of the "Gripsholm."



DR. H. FOSTER BAIN

Speaking at the Hotel Commodore on Dec. 7 at a joint dinner meeting of the New York Section of the A.I.M.E. and the Mining and Metallurgical Society of America where he was the guest of honor, Dr. Bain sketched briefly the life of the civilian internees, which from his description seems, in the main, to have afforded abundant leisure, though barren of the usual comforts. Following the meeting, he left for Washington, intending to go from there to his ranch home at Steamboat, Nev.

Chester Alan Fulton, president of the Southern Phosphate Corporation, Baltimore, Md., has been elected president of the American Institute of Mining and Metallurgical Engineers for 1944.

Lieut (j.g.) George F. Weaton, Jr., U.S. N.R., formerly with the Cerro de Pasco Copper Corp. in Peru, is now stationed at the Naval Supply Depot, Mechanicsburg, Pa. He is living at 1412 South 13th St., Harrisburg, Pa.

Fred Posse, formerly at Summitville, Colo., has taken a position at the fluorspar property of the Humphreys Gold Corporation at Hot Springs, N. M.

Leon W. Dupuy has recently been appointed assistant regional engineer for the eastern region of the U. S. Bureau of Mines with headquarters at College Park, Md.

B. I. Nesbitt, field geologist for Kelowna Exploration Co., subsidiary of South American Development Co., has returned to the Nickel Plate mine, Hedley, B. C. He will spend the winter there as mine geologist and assistant to the chief engineer. He spent the field season in examining and developing strategic metals properties in southern British Columbia.

John Knox is retiring as general manager of Hollinger Consolidated Gold Mines, Limited, at the end of the year, but will remain with the company as consulting engineer, and in addition will be in charge of all outside operations exclusive of the Ross mine. **E. L. Longmore** has been appointed manager of the Hollinger mine, at Timmins, Ont., and the Ross mine, at Ramore.

Dr. Paul D. V. Manning, director of research since 1941 for International Minerals & Chemical Corporation, Chicago, has been elected a vice president of the company. Prior to his connection with International, which began in 1942, he was vice president of Western Condensing Co. and director of research for Golden State Company, and was generally engaged in consulting work. He also served as Pacific Coast editor of *Chemical and Metallurgical Engineering* from 1926 to 1942.

DR. PAUL D. V. MANNING

Dr. Leo Lehr Carrick, until recently dean of the school of chemical technology of the North Dakota Agricultural College, Fargo, N. D., has been appointed director

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of red lead research and consulting chemical engineer of the Lead Industries Association. He will make his headquarters at the Association's office, 420 Lexington Ave., New York City.

C. N. Schuette, consulting mining engineer, and **Edward Wisser,** mining geologist, have moved their offices in San Francisco from 533 Call Bldg. to 204 Sharon Bldg., Zone 5.

T. C. Harrison, until recently employed in a consulting capacity with Pato Consolidated Gold Dredging Company, Pato, Colombia, has returned to the United States from South America and is at present acting in a consulting capacity in the Heavy-Media Separation plant of the Ore and Chemical Co., Leadville, Colorado. Mr. Harrison's home is in Denver.

P. A. Lewis, Reno, Nevada, is in charge of exploration in the Western States for the American Metal Company of Colorado, a subsidiary of the American Metal Company, Ltd., New York.

Dr. L. Keith Ward, director of mines and government geologist in South Australia, has been honored with the I. S. O. decoration.

J. W. Southin, formerly superintendent of the Granby Consolidated's power plant at Princeton, B. C., was in British Columbia recently when he inspected the Tyee mine, in which he is interested.

James Wong has accepted a position with Hudson Bay Mining and Smelting Co., Ltd., at Flin Flon, Man.

Charles Ney has returned to Vancouver after spending the past season in the field for Pioneer Gold Mines of B. C., Ltd.

Fred L. Wolf, who has been connected with the War Production Board as Deputy Director of the Mica-Graphite Division, resigned Nov. 2, to become executive vice president of the Ross-Tacony Crucible Company, Tacony, Philadelphia.

E. M. Johnson, of Henryetta, Okla., has retired from his long connection with the Eagle-Picher organization. This retirement comes after 27½ years of service as superintendent and subsequently as manager for the Eagle Picher Lead Company and, later, the Eagle-Picher Mining & Smelting Company.

Dr. C. H. Mathewson, president of the A. I. M. E., and **A. B. Parsons,** secretary, recently made a tour of the western mining states, calling on local sections of the Institute en route.

E. N. Goddard, of the U. S. Geological Survey, has been examining properties in the Georgetown district in Colorado.

W. F. Boericke, who is among the internees remaining at Santo Tomas University, in Manila, is reported to be in good health.

Ludlow G. Anderson, who has been associate engineer with the U. S. Bureau of Mines in Alaska, has been made district engineer in charge of safety training in mines in the Territory, succeeding **Harry Kane,** who is retiring because of ill health. Mr. Anderson's headquarters will be in Anchorage.

P. Malozemoff, for the past two years manager of Minas de Abangarez, San Jose, Costa Rica, expects to be in New York for the next several weeks. He may be addressed at 63 Wall St., New York 5, N. Y.

P. MALOZEMOFF

Fred Jones, of Denver, has been appointed State Commissioner of Mines for Colorado, succeeding Edward P. Arthur, who was killed last August when his car left the highway near the Treasury Tunnel. Mr. Jones is a graduate of the Colorado School of Mines, and was formerly superintendent of the Portland mine at Cripple Creek.

Obituaries

A. B. Trites, an outstanding figure in mining in western Canada, died in Vancouver Oct. 22, aged 80 years. He was a member of the syndicate which acquired and developed the famous Premier mine in the Portland Canal mining division. He was also associated with the financing of the Big Missouri in the same district, and more latterly with Spud Valley in the Zeballos district. He was president of Pacific Mines and Development Co., Ltd. Mr. Trites was born in Cloverdale, New Brunswick, and came to British Columbia 45 years ago. He is survived by one brother.

Alfred Christian Garde, British Columbia mining engineer, died Nov. 13. He was born in Europe and had taken an active part in the mining development of this Province for the past 45 years. Following a brief association at Anaconda, Mont., with F. Augustus Heinze and Marcus Daly, he came to Rossland, where he was placed in charge of first the War Eagle, and later the Centre Star, mine. Following this he superintended silver-mining operations at the Payne mine in the Slocan. Subsequently, he took up residence in Prince Rupert and devoted himself to the development of Omineca properties.

Dr. Stafford F. Kirkpatrick, aged 65, mining and metallurgical engineer, died at Vancouver Nov. 15. In 1939 he retired as vice-president and managing director of Deloro Mining and Smelting Co., Ltd. He was born in Manitoba and graduated from McGill University in 1900, later becoming professor of metallurgy at Queen's. In 1917 he was awarded the McCharles prize for his work with the cobalt ores of Ontario. He was a member of the C. I. M. M. and the A. I. M. E.

D. J. Shelton, president and general manager of the Marion Steam Shovel Company, Marion, Ohio, died on Nov. 27, after a brief illness. He was elected president in 1941 after 34 years of service with the company.

Homer Littlefield, manager of the mining department, Marion Steam Shovel Co., died suddenly at his home in Columbus, Ohio, on Sunday, Oct. 17, age 66.

Sir Henry Strakosch, prominent in the South African mining field, has died at the age of 72. Under his chairmanship the Union Corporation became one of the largest and strongest of the several mining financing houses. He was also a director of Burma Corporation, East Geduld Mines, Geduld Proprietary, Northern Rhodesia Power, Rand Agency, San Francisco Mines and Selection Trust, these being only a few of the companies in which Union Corporation had large holdings. Sir Henry was an economist and a banker. He was credited with the authorship of the South African Currency and Banking Act, was an adviser of foreign countries on currency and finance, was a member of the Royal Commission on Indian Currency and Finance, and was invited to become an official delegate at both the Ottawa Conference and at the World Monetary and Economic Conference in 1933. He was a strong supporter of the gold standard and the author of several publications on gold, currency and monetary and economic problems.

Charles Morris Evans died Oct. 29 at Gold Hill, Tooele County, Utah, of heart trouble. Born in Salt Lake City, in 1875, Mr. Evans had taken part in mining activities at Alta, Park City and Deep Creek.

Ernest C. Lane, president of Swansea Development Company, operating the old Swansea mine near Bouse, Ariz., died in Phoenix, in that State, recently, aged 68. Prior to coming to Arizona 32 years ago he had engaged in mining in British Columbia, Nevada, Utah and Colorado.

George W. Long, 72, prominent in Arizona mining for more than 40 years, died in Phoenix Oct. 28. Born in Colorado City, Colo., he grew up in the famous mining districts of his State. He went to Alaska in the gold rush of 1898. In 1900 he went to Arizona and for seven years was superintendent of the Bisbee Extension mine. In 1913, in company with J. L. McIver, of Phoenix, he became interested in the development of the United Eastern mine at Oatman, finally disposing of it.

Dr. Herman LeRoy Fairchild, past president of the Geological Society of America and one of its founders, died at Rochester, N. Y., on Nov. 29, aged 93 years. After teaching at various schools following his graduation from Cornell in 1874, he became professor of geology and natural history at the University of Rochester, which position he held from 1888 to 1920, when he resigned to become professor emeritus. He was an authority on Pleistocene geology.

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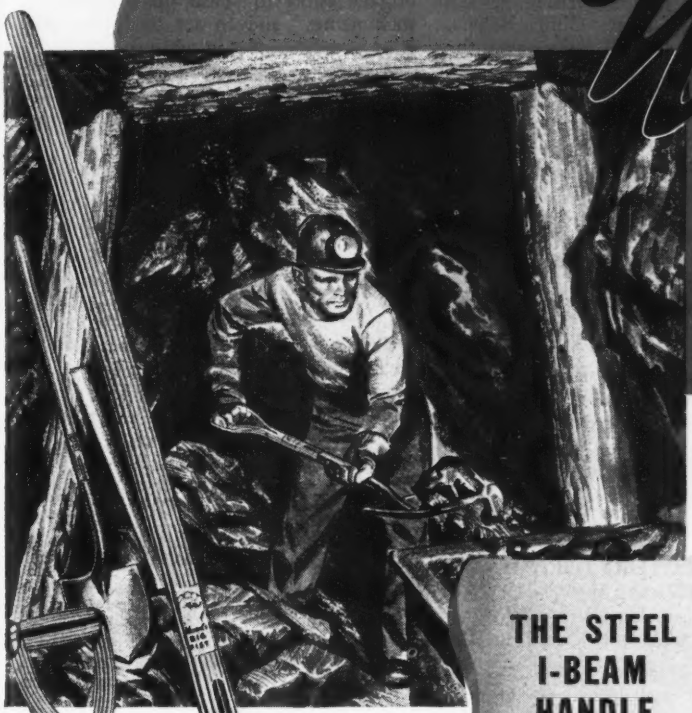

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BOOKS & PUBLICATIONS

STANDARD METAL DIRECTORY, 1943. *Atlas Publishing Co., New York, N. Y. Pp.* 702. *Price* $10.

In the Ninth Edition of this work, the first issued since 1940, the publishers have completely revised the contents to accord with wartime changes in the United States and Canada.

More than 7,000 detailed reports will be found in the four sections of the book dealing with iron and steel plants, ferrous and non-ferrous metal foundries, metal rolling mills, and smelters and refiners of non-ferrous metals. Lists are arranged alphabetically by States. In addition to the four major sections will be found lists of manufacturers and distributors of pig iron, ores, and alloys; smelters and refiners of new and old metal; storage-battery manufacturers; solder manufacturers; sheet-metal stamping works; galvanizers; die-casting plants; secondary-metal smelters; railroad purchasing agents, copper, lead, and zinc brands; scrap iron and scrap metal dealers.

The directory is a valuable reference work for the metal industries and of special value to purchasing agents and sales managers.

TUNGSTEN. *Its History, Geology, Ore-Dressing, Metallurgy, Chemistry, Analysis, Applications and Economies. By K. C. Li and Chung Yu Wang, Reinhold Publishing Corporation,* 330 *W. 42d St., New York. Pp.* 325. *Price* $7.

Noting at the outset that this book is one of the series of scientific and technologic monographs, the preparation of which was undertaken by the American Chemical Society, the reader, thus led to anticipate a superior product, is not disappointed. The authors have made a valuable and interesting contribution to technical literature.

China leads the world as a tungsten producer, having contributed 37 percent of the total output from 1913 to 1937. Mr. Li, the senior author, well known for years as chairman of Wah Chang Trading Corporation, in New York, importers of Chinese tungsten, describes in a charming foreword, how this important source was first brought to attention 32 years ago, through his discovery of wolframite in quantity in Yao Kang Sein, while prospecting for tin in south China. As the news spread, the exploitation of the native occurrences of tungsten increased and today China's reserves are estimated at approximately ten billion pounds of WO_3. The production has meant millions of dollars to the Treasury of the young Chinese republic.

The scope of the new volume is amply expressed in the eight topics, (each corresponding to a chapter) composing its subtitle, already given, with the additional fact that in the volume itself the authors have cannily inserted a chapter dealing with possible substitutes for tungsten, such as might arise under current wartime conditions. The appendix adds the details of Metals Reserve Company's terms of purchase of tungsten ores originating, respectively, in the United States, China, Bolivia, Argentina, Mexico, and Cuba; also the details of the so-called Hamburg contract under which Chinese wolfram ore has been sold in Europe.

Outstanding in interest is the chapter (two) on geology, 89 pages long, 34 of which are devoted to the ore occurrences in China and Burma. Correspondingly prominent is the 42-page chapter on ore dressing that follows, with numerous flowsheets and a bibliography of 126 items. The 105 pages on tungsten metallurgy and chemistry that come next present a great deal of information about the metal and its preparation and the various salts and compounds derived from it. The book should prove very useful, especially in view of the authors' familiarity with the subject and the thoroughness of their treatment of it.

MINING DIRECTORY OF MINNESOTA, 1943. *By Henry H. Wade. Mines Experiment Station, University of Minnesota, Minneapolis, Minn.* 4¾ x 5¾ *in. Pp.* 235. *Price* $1.

This valuable pocketbook of information on the mines and companies of the Minnesota Iron Country, and on iron ores and the industry in general, again appears, with its contents brought up to date for the current year. The new revision has been produced by Henry H. Wade, of the Mines Experiment Station staff, who replaces John J. Craig, whose name previously appeared on the cover for the last 21 years. A large amount of practical information has been condensed within a surprisingly small amount of space.

ERUPTIVE ROCKS. *Second Edition. By S. James Shand. John Wiley & Sons, New York, Pp.* 444. *Price* $5.

The new edition prepared at Columbia University, where Dr. Shand is professor of geology, has had the benefit of better library facilities, he says, than did the first which was written in South Africa 16 years ago, when he was professor of geology and mineralogy at the University of Stellenbosch. The type for the later volume, as in the case of the earlier one, was set in England, however, and, thanks to the war, three years elapsed after the manuscript was delivered to the printer before proofs were received, precluding more than brief reference to certain "important contributions to petrology."

Many changes mark the new edition, in comparison with the older book. The text has been rewritten in large part, and considerably rearranged. Much new material has been added and some that appeared in the 1927 volume dropped, notably the concluding chapter on eruptive ore deposits. Dr. Shand has persisted in his original effort to "clear up the jungle of rock names" and to set forth the problems in petrography in more specific terms, and in all to give preference to the practical rather than to the academic.

"SALVAGE MANUAL FOR INDUSTRY." *Published by Salvage Division, War Production Board, Washington, D. C. Pp.* 243. *Price* 50 *cents.*

Appearing at this time, this volume should be of considerable use in plants manufacturing war material, although an earlier publication date would have increased its immediate value. Postwar salvage projects should profit especially by such a study of an organized salvage program. The first five sections treat, in order, Organizing and Planning; Administrative Factors; Salvage Practice-Metal Scrap; Nonmetallic Waste; Case Histories. An additional section is devoted to "waste material hints," which is a classified list of scrap items. The book is well illustrated. It has been prepared under the direction of an editorial board borrowed from industry and the business press.

METALLOGRAPHY OF ALUMINUM ALLOYS. *By Lucio F. Mondolfo, John Wiley & Sons, Inc., New York. Pp.* 351. *Price* $4.50.

This book is offered primarily to plant metallurgists interested in aluminum alloys who have grown in numbers as the alloys have become more widely used. The 17 chapters are grouped in four sections. The first section assembles information thus far published on equilibrium diagrams, binary, ternary and quaternary, including also data derived from Mr. Mondolfo's experiments. The second deals with polishing and etching. In the third the commercial alloys are discussed, a separate chapter being devoted to duralumin. Part IV has to do with melting and casting, working, heat treatment, and corrosion, in short with the effect of fabrication on the microstructure. A bibliography of over 1,000 items is included.

PUBLICATIONS RECEIVED

Gold Mining Industry in Canada, 1942. *A Summary Review.* Dominion Bureau of Statistics, Ottawa, Ont. Pp. 67. Price 50 cents.

Transactions of the Institution of Mining and Metallurgy. Vol. 51. Published at

the temporary office of the Institution, The Royal School of Mines, London S.W. 7. England, Pp. 349.

Flotation Index. Great Western (Electrochemical) Division, The Dow Chemical Co., San Francisco, Calif. Pages 94 to 101 inclusive, covering material published in 1942, have been received for insertion in this loose-leaf index.

Magnetic Work in St. Louis County in 1942. By George M. Schwartz. Report of Investigation No. 1 Published by Office of Commissioner of the Iron Range Resources and Rehabilitation, St. Paul, Minn. Pp. 20, plus several maps and charts.

French West Africa. Bulletin No. 4, "Geological Sketch of French West Africa," Pp. 135 and map. Also Bulletin No. 5. Pp. 207. "A Petrographic Description and Geological Study of Forest Area of French Guinea" (thesis of Government Geologist for Doctor's degree). Issued by Service des Mines, Dakar. Both bulletins in French.

Geologic Formations and Economic Development of the Oil and Gas Fields of California. Bulletin 118, prepared under the direction of Olaf P. Jenkins and issued by State Division of Mines, San Francisco, Calif. Pp. 773. A good summation of this California industry.

Manganese-Bearing Veins in Southwestern Virginia. Virginia Geological Survey, University, Va. Pp. 16.

Engineering Index, 1942. Over 25,000 annotations of important articles on all branches of engineering published in current technical periodical literature during the year, and approximately 40,000 cross references to these annotations. Engineering Index, Inc., 29 West 39th St., New York, N. Y. Price $50.

Crow Wing County. (Cuyuna Range) Minnesota. Annual Report of Mine Inspector (Oliver Stark), Crosby, Minn., Year 1942.

"Extraction of Alumina from Clay—Bibliography" (with short discussions). Bulletin E-1. Mining Experiment Station, Pullman, Wash., Pp. 31, Price 25c.

Oil and Gas in Middle Tennessee. The Division of Geology, State of Tennessee, Walter F. Pond, State Geologist, Nashville, Tenn., has issued a 22 x 26-in. sheet on which are assembled a map of Tennessee, 15 in. wide, showing the oil and gas pools in the State; a 13½ x 8½-in. columnar section showing the stratigraphy, the producing horizons, the lithology, and the areal distribution; and, third, a brief history of oil and gas developments in Tennessee, with a table of data which includes, among other things, the production of each of the various pools or districts to date, the producing horizon, the structure, and the deepest horizon thus far tested.

The Mining Industry of Quebec, 1941. Department of Mines, Quebec, P. Q. Pp. 104.

Geology of Southeastern Venezuela. Bulletin of Geological Society of America. New York. Pp. 849-872.

*Vermont, Report of State Geologist—*1941-2. By Elbridge C. Jacobs. Pp. 83.

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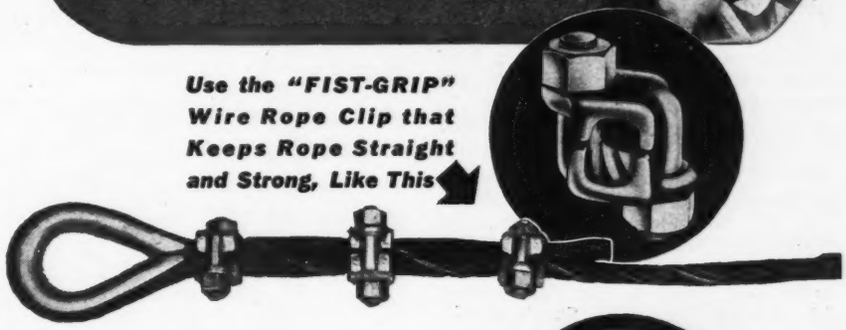

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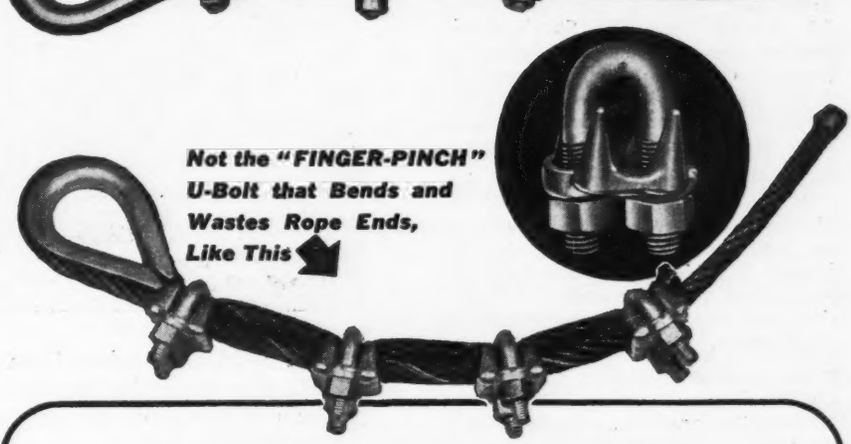

NOTE: The photographs of wire rope assemblies shown here are exact representations of two ¾-inch ropes fitted with recommended number of clips; all nuts on both wires uniformly tightened with indicating wrench. When "Fist-Grip" Clips are used, rope remains straight, whether or not load is applied.

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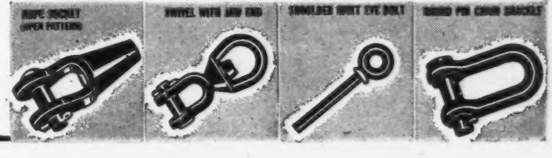


REGIONAL NEWS

CALIFORNIA

Combined Metals asks WPB approval for California zinc plant—Carson Hill plans post-war operation

▶ California mineral production in 1942 exceeded that of any year since 1929. The total value, $408,738,434, exceeds by $34,412,206 that of 1941. Gold production, 847,997 oz., came from 434 lode and 428 placer mines. Copper output was 2,138,149 lb., lead was 10,329,176 lb., zinc was 1,275,795 lb., and silver, 1,450,440 oz. W. W. Bradley, state mineralogist, reported that the unusually high value of the total output this year was due to the State's production of iron, molybdenum, quicksilver, tungsten, chromium, and manganese, all strategic metals. The industrial minerals showed a small increase over 1941; the saline group showed a marked increase.

▶ Consolidated Gold and Metals Corp., with various holdings in the Portola area of Plumas County, reports that some copper production is expected in the near future. J. R. Walker of Salt Lake City is president of the company. Exploration work is reported under way at the Engels mine.

▶ The Altoona quicksilver mine in the Carville district of Trinity County, once an important producer, is reported to be producing quicksilver after development by Marsman Co. of California. E. E. Erick is manager.

▶ Development is in progress at the Hastings quicksilver property in the Sulphur Springs district, northeast of Vallejo, by Belmont, Osborn Gold Mining Co. lessee. The Hastings is an old property.

▶ Carson Hill Gold Mines Corp. has sold all mining and milling equipment at Melones, where a fire damaged its plant last year. When gold mining is resumed, a new plant is planned.

▶ New quicksilver deposits, exposed by exploration, are reported at the old Harrison mine recently brought into production by H. C. Scott. The mine is in the northwest corner of Yolo County near the Lake and Napa County lines.

▶ Combined Metals Reduction Co. has filed an application with the WPB for consideration of a zinc ore treatment plant for the eastern California area. The Miller zinc mine near Darwin, Inyo County, is being developed.

▶ Blue Moon Mines, subsidiary of Hecla Mining Co., is milling zinc ores at the Jenny Lind mill which was recently leased. The mine is in the Hornitos district.

▶ The California Hydraulic Miners Association at its November meeting in Nevada City discussed the desirability of the construction of two dams on the middle fork of the Yuba river for the purpose of catching flood waters and thereby enhancing water supply for the Nevada County hydraulic mining area.

▶ Western Mining Council (J. P. Hall, president) meeting in Nevada City is on record as opposing the Scrugham stockpile bill. Congressman C. Engle stated that the difficulty in the preparation of a bill satisfactory to the small producer of strategic minerals is the opposition of the State Department to any bill that would prevent importation of such minerals, such opposition stemming from the good neighbor policy.

Wide World

MICA SAMPLES, taken from a vein in a mine near Alstead, N. H., are examined by (left to right) John D. Bardill, U. S. Bureau of Mines district engineer, L. E. Barringer of the WPB Mica-Graphite Division, and J. Alfred Dennis, vice-president of the mining company and member of the New Hampshire mineral research committee

NEVADA

Nevada-Massachusetts mill burns — Anaconda subsidiary finds good prospects in Copper Flat area

▶ The 260-ton scheelite concentrator of Nevada-Massachusetts Co. near Mill City, Pershing County, was destroyed by fire early on Armistice day, 25th anniversary of the start of the original small unit. It had been the largest producer of tungsten in the country until surpassed last year by the 1400-ton U. S. Vanadium Corp. plant near Bishop, Calif., then by the Yellow Pine plant of Bradley Mining Co. at Stibnite, Idaho. Equipment of a test plant near the Mill City concentrator, as well as the company's 1000-ton flotation tailing plant, 2000 ft. distant escaped damage. Loss was variously estimated up to $500,000. Mining continues; the ore is stockpiled, and it was indicated a heavy-duty crusher would be provided from which the fines would go to the flotation plant. Charles H. Segerstrom, president, intimated that rebuilding may depend upon adjustment of loss by insurance actuaries who have been on the ground. The product of the destroyed plant has not received the bonus price, and the currently uncertain outlook for price and demand may affect plans to replace the concentrator. Ott F. Heizer is manager at Mill City.

▶ Construction work that will increase capacity of the Caselton selective-flotation mill of Combined Metals Reduction Co. at Pioche from 15,000 tons to 24,000 tons per month has been delayed by a jurisdictional dispute between CIO and AFL workers. Federal and state labor board officials after extended conferences now hope for early settlement.

▶ Dayton Dredging Co., having partly dismantled its 10,000-cu.yd. dragline dredge at Dayton, largest of its type in the world, has been engaged for some

time in sampling gravel deposits of Nevada Porphyry Gold Mines, Inc., at Round Mountain, Nye County, worked formerly by hydraulic methods and with large production of placer gold by Round Mountain Mining Co., under direction of L. D. Gordon, now RFC loan division engineer for Nevada. R. S. Crocker is manager at Round Mountain for the Dayton company, which was reported lately to have acquired the old Keystone lead-zinc-silver mine in the Central district, northern Pershing County, where prospect drilling is in progress with W. H. Waters of Winnemucca in charge.

▶ Faced by labor shortage and other wartime obstacles, the Nivloc mine of Desert Silver Inc. in Esmeralda County was closed down in August and all mine and mill equipment, installed late in 1937, was offered for sale at public auction in early November. The 200-ton cyanide mill, built at a cost of $263,000, had been treating up to 225 tons with high recovery and was the largest producer of silver in Nevada during six years. Fred E. Gray is manager and Ira B. Joralemon is president of Desert Silver Inc. The company is an independent association of engineers and not, as frequently reported, a Bralorne Mines Ltd. subsidiary.

▶ Employing as many as eight or nine diamond and churn drills in prospecting the Copper Flat area just west of Yerington, International Smelting & Refining Co., Anaconda subsidiary, was halted by water in sinking a three-compartment shaft below the 300-ft. point. A standard oil-well drilling rig was brought in and a 16-in. hole started, but the drill was deflected by an inclined fault plane. After moving the rig to the other side of the shaft, the hole was completed below the shaft bottom, and pumping is said to have drained the shaft enabling continued sinking. Drilling results are said to indicate a future open-cut operation of major proportions. Robert S. Moehlman, 29 E. First St., Reno, directs Anaconda's geological field work in Nevada.

▶ Manganese is being produced in fast-growing volume in the nodulizing plant of Manganese Ore Co., subsidiary of M. A. Hanna Co. of Cleveland, financed by the RFC and designed to treat 1100 tons per day of low-grade manganese ore from the near-by Three Kids mine near the Basic Magnesium plant in Clark County.

▶ In the Ivanhoe cinnabar district, western Elko County, the Silver Cloud mine of New Verde Mining Co., a Newmont subsidiary, with two furnaces treating around 125 tons of ore per day, has been leased on royalty basis to R. O. Camozzi, R. D. Morris, and David Lee. Mr. Camozzi, manager of the Ivanhoe property during the past year, has been in charge of other Newmont enterprises in late years. The mine is served by a new access road from Battle Mountain, postoffice and rail point for the productive district.

▶ Granted priorities for construction materials and water system, Molybdenum Products Co., E. George Howe, president, with offices in Reno, is proceeding

Fractured 14,000-Pound Mantle *Salvaged by Amsco Conservation Welding . . . .*

A fracture 28" in length developed in a 14,000-pound manganese steel crusher mantle in a large limestone crushing plant. Either a new casting had to be ordered, which might take months to obtain, with the possibility of complete shutdown in the meantime; or the cracked mantle must be repaired by welding. The company's welders were dubious, as the metal section was approximately 3½" thick.

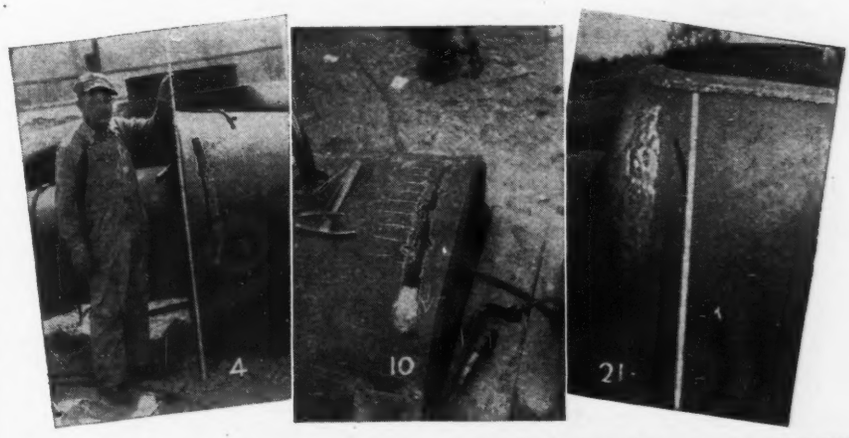
Knowing that Amsco manufactured welding materials, as well as crusher parts, the company called on us for advice. Inspection indicated that the crack in the mantle, which was not of Amsco manufacture, was due not to any operating fault but to foundry defects.

The defective metal was burned out and the area cleaned of scale as shown in Picture #4. Amsco Nickel-Manganese Steel Welding Rod was applied, 2" steps being welded at a time; the operator working from the ends of the crack toward the center. Picture #10 shows the work in progress, with a pneumatic air hammer at hand in order to peen each deposit thoroughly. This stress-relieving measure is important in the welding of manganese steel.

After the fracture was completely welded, corrugations were formed on the mantle for greater efficiency in handling large rock. ⅜" Amsco Nickel-Manganese Steel Filler Bars were applied longitudinally and filled in along the sides with Amsco Nickel-Manganese Steel electrodes. Two layers of Economy Hardface were deposited on top of the corrugations. This coating has a Brinell hardness of 450-550, and takes the initial wear while allowing the manganese steel underneath to work-harden. Picture #21 shows the crack completely welded, and one of the corrugations.

The cost of reclaiming this casting was much less than the cost of a new mantle, and 14,000 pounds of casting metal were saved.

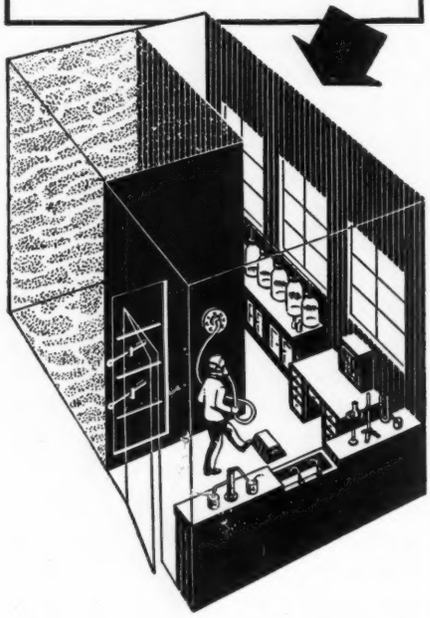
Ask for Bulletin 941-W on Amsco Welding Products.



Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

The gas chamber that lengthens life



IN this gas chamber you could meet, at one time or another, all the gases that afflict industry and threaten its workers' lives.

Here Willson scientists add to their knowledge of lethal vapors, and how to make them harmless. Here they test the masks and respirators on whose unfailing performance human beings stake their lives. This is a fearful responsibility; and the Willson life-lengthening gas chamber is only one of countless ways by which that responsibility is discharged.

***All* Willson protection is scientifically engineered to yield the utmost in safety and comfort. That is why so many Safety Directors and Purchasing Agents specify Willson for head, eye and lung protective equipment.**

For 73 years Willson has been a leader in preventing industrial accidents.

WILLSON APPROVED UNIVERSAL GAS MASK

Approved by Bureau of Mines for protection against the great variety of poisonous gases, smokes and vapors—including carbon monoxide—resulting from industrial operations.

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Nevada *(continued)*

with development of its Blue Bucket cinnabar mine in the Bottle Creek district of Humboldt County. Late development, supplemented by extensive drilling by U. S. Bureau of Mines crews, is said to have opened orebodies of great extent and uniformly high grade. A furnace designed for a calcining and sintering process, said to have been highly successful in northern districts, is being fabricated on the Coast for early installation.

▶ Additional mine equipment has been moved by Bradley Mining Co. from its Opalite cinnabar mine just over the state line in Oregon to the Goldbanks properties in eastern Pershing County, where earth-moving equipment is stripping a wide area in preparation for a large-scale open-cut operation. O. L. Cash, manager of Nevada-Oregon activities of the Bradley company, with office at McDermitt, has indicated that a large-capacity furnace plant may be provided at Goldbanks, from which point some ore of high grade is being trucked 140 miles to the Opalite plant.

▶ The one hundredth 75-ton carload of copper ore was shipped in mid-November to the Garfield, Utah, copper smelter of A. S. & R. Co. from the Greenan-Kerr copper-tin mine at Majuba Hill, Pershing County, where development work on the level of the middle tunnel is said to be blocking out ore of shipping grade in large volume. J. O. Greenan, Reno, is in direct charge. Final settlement has not been received from the Longhorn tin smelter in Texas for several thousand pounds of tin in 72-per cent concentrate produced from test mill runs on cassiterite from the tin section of the mine.

▶ Management of Griff Mines Inc., operating the Antelope lead-zinc-silver mine in Pershing County, has entered into a contract with Kuenzel Smelters of Reno to build at Imlay, the rail point, a 200-ton lead-zinc reverberatory furnace. C. E. Griffiths is president and manager, with office at Imlay.

▶ A deposit of what is pronounced to be acid spar of high quality in Black Canyon, Pershing County, has been taken under option from Lovelock men by Cooper Shapley, acting for General Chemical Co., subsidiary of Allied Chemical & Dye Co. With Shapley, and acting for the War Department, was Maj. R. B. Silverman, mining engineer of the St. Louis ordnance district. He announced shipments would begin at once, up to 300 tons per day, and a concentrator may be provided.

▶ With completion of a new road to his Red Hawk tungsten property in Pole Canyon, near the Nevada-Massachusetts mines in Pershing County, Maj. Leverett Davis of Boise, Idaho, manager of mines for Callahan Zinc-Lead Co., was reported to have shipped a carload of scheelite of exceedingly high grade. Under the name of Leverett Davis Mining Engineers, he is reopening the old Mount Hope zinc-cadmium mine in Eureka County, leased from Columbia Steel Co., U. S. Steel subsidiary, which has owned the formerly productive mine for many years. Davis' main office is in Boise, whence he flies his own plane to the mines.

▶ A contract involving the largest trucking operation undertaken in this country, between Basic Magnesium Inc, and the Reno trucking firm of Wells Inc., provides for delivery of 160,000 tons per year of magnesium oxide from the Gabbs Valley calcining and flotation plant to the magnesium metal plant near Boulder Dam in Clark County, a haul of around 340 miles. About 20 truck units employing 112 persons will make the round trip in 28 hours. Specially-designed trucks, costing $24,000 each with trailer, will be 69 ft., 11 in. long, diesel-powered, using 11 by 22-in. tires on 30 wheels, each unit weighing 45,000 lb. empty and carrying pay load of 28 to 30 tons. Garages for maintenance and repair will be established at Luning and Las Vegas. Howard Wells is president and Joseph Wells is manager.

▶ Nevada Celatom Co., with headquarters in Chicago, Ill., is mining a fresh-water diatomite deposit in Storey County, Nevada, to produce a granular product for a new use, that of poultry litter. Production is at a rate of about a carload a day. Henry Mulryan, Los Angeles, is consultant for the company.

ARIZONA

Asbestos buying depot opened at Globe — Three Kingman operations close—Havasu mine ships ore

▶ Operations of United Lead Zinc Mines Inc. on the Lead Carbonate and Columbus properties in the Wallapai mountains north of Kingman have been suspended according to Mansur Katleman of Los Angeles, president of the company. The company recently completed reopening of the property by means of a $5000 RFC loan. The second loan for development purposes was not granted. J. H. Hoffman of Kingman was general manager.

▶ Lessees of the Keating mine northwest of Morenci in Greenlee County are preparing to ship 50 tons of copper ore daily. The property is owned by Dome Copper Co. and is under lease to Auto Specialties Manufacturing Co. of St. Joseph, Mich. A large compressor and power unit have been installed recently.

▶ The Corregidor mine, consisting of six claims, adjoining the Control mine in the Old Hat mining district near Oracle is being reopened by Newt C. Wells of Oracle. During 1942 the Larson brothers, operating under a lease, shipped 200 tons of tungsten ore to the Jacobs plant in Tucson.

▶ The Morning Star or Fortuna mine near Oracle, property of Mrs. E. L. Wood of Oracle, has been leased to the Rivers Brothers of Oracle. The property has produced considerable tungsten.

▶ Operations at the Summit in the Wallapai district, Mohave County, have been suspended. Operating under a lease from L. L. Robinson of Los Angeles, and financed by an RFC loan, the El Dorado-Rover Mining Co. shipped zinc-lead ore to the Midvale, Utah, smelter, but these operations proved unprofitable. J. D. McPherson of Kingman was manager and W. S. Eddleman of Reno, Nev., mine superintendent.

▶ Dye and Bathrick of Kingman have been granted an RFC loan on the Copper World mine which they are operating under a lease from the owner, Phelps Dodge Corp. The property is east of Yucca in the Cedar Valley mining district.

▶ Diamond drilling operations at the White House property by Basic Refractories Inc. have been completed. R. A. Martin of Oatman and H. F. Heather of Pasadena, Calif., are owners and have leased the property to Basic Refractories.

▶ A rehabilitation loan of $5000 has been granted by the RFC for work on the O'Brien property in the Wallapai district in Mohave County. The property is owned by W. S. O'Brien of Kingman.

▶ Havasu Lead and Zinc Mining Co. has made a shipment of over 50 tons of ore from the Johnson claims in Coconino County near Supai. R. M. Sanderson is secretary of the company and in charge of the operations. M. B. Clark is president and E. B. Stephens, vice president.

▶ The Music, Lucknow, North Star, and Roosevelt claims in the Music Mountain district of Mohave County have been acquired by Claude and Leonard Neal of Kingman. The Roosevelt and North Star were formerly worked by Dean Hogue of Kingman.

▶ Phil Redondo of Kelvin has leased the Peg Leg mine 8 miles south of Wooley Siding to Theodore Phillips of Ray. There are two shafts on the property, one 200 ft. and the other 400 ft., from which siliceous copper ore has been mined.

▶ C. L. Baker of Prescott has leased the old Berberich mine, now known as the New Strike, from the owner, M. B. Hazeltine of Prescott, and has been granted an RFC loan for rehabilitation purposes.

▶ Walter Sims and Mrs. Henriette Miller of Tucson have leased the Abril mine in Cochise County belonging to the Abril brothers and Hal W. Smith of Tombstone. An RFC loan of $15,000 has been granted to the lessees. The ore carried values in copper, zinc, gold, and silver.

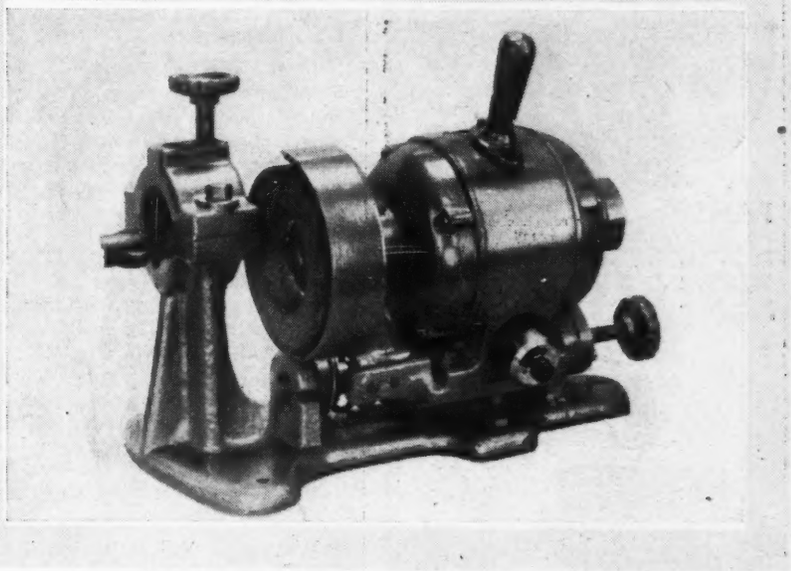
▶ The Coronado mine in the Old Hat district in the Catalina mountains has been leased to Charles M. Taylor, county assessor for Pima County. Application has been made for an RFC loan.

▶ Gilbert Mock of Mayer is shipping approximately 200 tons per month of oxidized copper ore from the Binghamton mine east of Mayer in the Agua Fria mining district.

▶ The Kaibab mine near Jacob Lake in Coconino County is being operated by Apex Mining Co., H. W. Patterson of

Another Blount Help Toward

TROUBLE-FREE DRILLING AND LONG SERVICE—



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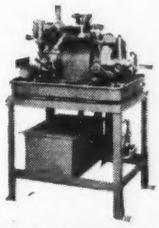
Squared-up ends and smooth contact between drill shank head and piston are vitally important to trouble-free drilling and to long service from your equipment. The Blount Shank Grinder is a simplified, compact, efficient unit for grinding shanks, pistons and anvil blocks. It is a necessity in any fully equipped drill shop.

The operation is simple. The part to be ground is clamped in the V-block so that the end just clears the face of the wheel. Turn on the power, and advance the wheel up to the work by turning the fluted hand wheel. With the handle on top of the motor, pass the wheel back and forth across the work, advancing as necessary, until the end is ground bright and square. Any corner burrs can then be trimmed off against the side of the wheel.



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Features low cost. Highly portable. Easy to shift. Popular with workmen. Built-in wheel truing device, easily, positively adjusted. Electric or gas driven models—2, 3, 5, hp. motor; 12", 14", 18" wheels, respectively. Will speed production on the job because of their simplicity and performance.

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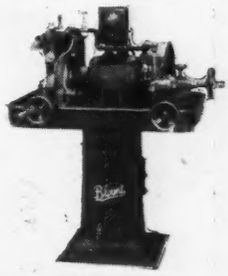

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Actually "built and rebuilt" on the job, this Detachable Bit Grinder will grind bit to gauge or sizing, grind face or flutes of bit and can be used as a truing device. The external adjustable form wheel dressing device is an exclusive "BLOUNT" feature.

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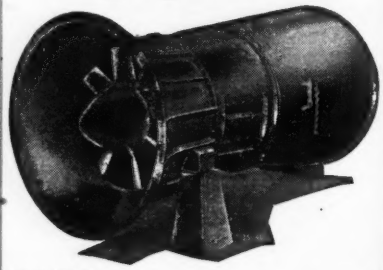

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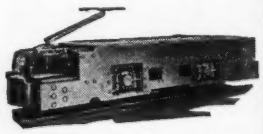
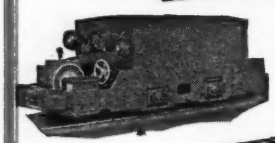
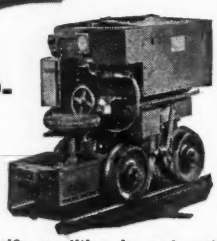




MINE LOCOMOTIVES



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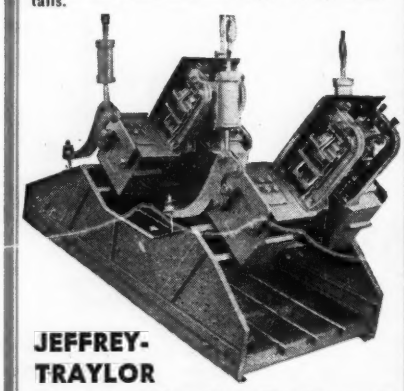

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COLUMBUS OHIO, U.S.A.

Arizona (*continued*)

Buffalo, N. Y., president. Ore mined by power shovels, amounting to 100 tons daily, is being shipped regularly to the Garfield smelter. The work is directed by Vincent M. Ryan of Jacob Lake.

▶ The Scenica mine near Wilcox, which was formerly operated by Dan Lewis and associates, is being operated by the owners, Le Roi Mines Inc. of Jackson, Calif. Carl B. Lancaster of Wilcox is manager and George F. Reed is superintendent.

▶ Action of the Defense Plant Corp. and Reconstruction Finance Corp. has assured the establishment of a custom asbestos purchasing depot and processing plant at Globe. The project will cost about $150,000, part of which will be provided by the operators, Pine Top Asbestos Co., J. S. Michault of Globe, manager. Mine development funds will be provided by Reconstruction Finance Corp. and plant construction will be provided for, in part, by Defense Plant Corp. The plant will afford Arizona asbestos producers a local market and proper grading facilities, which will insure a better price. The purchasing station fills a long felt want in this area where many small mines can produce an excellent grade of iron-free, high grade asbestos.

▶ William C. Yell of Tucson has leased the Fluorine property from E. J. Freilinger of Tucson, and has been granted an RFC loan of $5000. The property is in Pima County southwest of Tucson.

▶ Van Hook Mining Co. of Prescott is operating the Poverty mine in the Hassayampa mining district, having been granted an RFC loan.

▶ The old Bland mine in the Tyndall mining district of Santa Cruz County is being reopened and rehabilitated by A. T. Russell of Nogales, who has a three-year lease on the property. Rehabilitation is being financed by the RFC.

▶ The New Strike zinc property, belonging to M. B. Hazeltine of Prescott, and situated in the Walker mining district in Yavapai County, has been leased by C. L. Baker of Prescott, who has started reopening the property. A 40-ft. shaft has been cleaned out and the 250-ft. tunnel is being reopened.

▶ The Cerbat mine, one of the first producers of high grade gold and silver ore in the Wallapai district near Kingman, has been undergoing development recently by a group headed by F. Albert Morrison. It has been announced however, that these operations will cease temporarily, pending a more favorable labor and supply situation. The mine has recently produced some high-grade cerussite and galena ore.

▶ Mineral Park Mining Co., J. H. Hoffman, manager, has begun actual mining at the Kay copper mine near Mineral Park. Ore shipments go to Clarkdale.

COLORADO

New mill for Urad mine of Molybdenum Corp.—U. S. Vanadium at Rifle reduces output

▶ O. Barlow Wilmarth, in the Silver Plume section, is shipping ore steadily to the Huntington mill and about 100 tons per month to the smelters. The Smuggler, operated by the Mile High Co., has been shipping lead concentrates to the A. S. & R. smelter at Leadville and zinc concentrates to Amarillo, Texas.

▶ John A. Smith and Charles Sutton have installed a compressor at the Diamond tunnel of the Dives-Pelican. This level has been cleaned out and retimbered and excellent showings of zinc and lead ore, with zinc predominating, are said to have been found.

▶ At the Mendota mine, Wallace K. Howard has completed the installation of a hoist at the winze on the fourth level below the Victoria tunnel level, and ore from the fifth level will be hoisted with it. A streak of 20 to 30 percent zinc ore about 20 in. wide, carrying over 15 percent lead is said to have been opened-up. This ore will be milled at the Mendota mill and the bulk concentrate shipped to the Golden Cycle Mill.

▶ Louis A. Jessen, superintendent, and John F. Swiglow, secretary-treasurer, have opened up the Lucky Boy Mining Co. mine on Crystal Creek in the Gunnison territory. A mill has been built and some development work on the zinc orebody has been done. The winter season will not hamper activities, because of the lighter snow-fall in this section.

▶ A. E. Moynahan has opened up a streak of galena ore on the Mineral Park placer claim on Mt. Bross in the Alma district. He reports that 35 ft. from the shaft, a face of ore 8 ft. thick and about the same width was opened, and that the ore ran 20 percent lead with good values in silver. The first shipment of 50 tons has been made to the Leadville smelter. The claim adjoins the Alma Syndicate shaft where similar ore has been opened up and mined.

▶ The cave-in along a 40-ft. section of the Carlton tunnel, Cripple Creek, at a point about 20,000 ft. in from the portal presented a new critical problem to engineers. The fact that the water bulkhead caused a lack of oxygen in the area made it difficult for men to reach this point to remove the fallen rock. Air was forced through a pipe from the tunnel station on the 33rd level of the Portland mine, and an opening was made through the obstruction, permitting men to clear away the debris and retimber the caved section.

▶ Dickerson and Funderburk have installed a hoist and gallows frame at the Reveille mine in the Westcliffe section and are now cleaning out the shaft. This property has produced good ore.

▶Under the direction of A. M. Poston, the Lady Franklin mine at Westcliffe is working 16 men and producing about 40 tons of zinc-copper-lead ore per day. Considerable development work and a new shaft are planned for the winter.

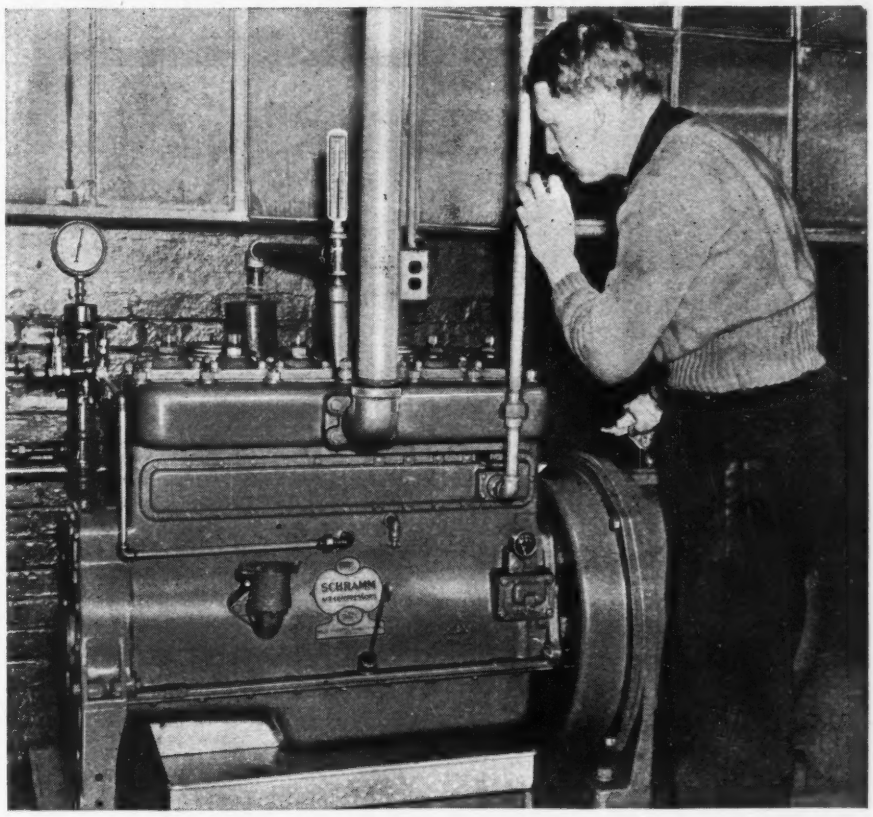
▶The Bull Domingo property in the Westcliffe mining section has been unwatered down past the 250-ft. level, and work is progressing nicely in opening the level to the zinc orebody.

▶The history of mining in the San Juan region, bounded by Ouray on the north, Silverton on the south, Telluride on the west, and Eureka on the east, has been largely an account of attempts to transport ore through and out of some of the most precipitous mountains in the world without wasting all potential profits in doing so. This problem is now being solved, in so far as the Black Bear mine is concerned, by boring 7,400 ft. through the granite interior of a 13,000-ft. mountain range at a cost of $1,300,000. Just below the crest of this range on the Telluride side, a glacier once scooped out a basin far above timberline in forbidding country less than four miles from Telluride but at an altitude 4,000 ft. higher. Here, the site of the Black Bear mine, a few timbers with cables attached is all that remains of the 2½-mile aerial tramway built by the late Bulkeley Wells in an attempt to beat the Black Bear transportation problem. Operating such an aerial tramway in this country was impossible; yet he left blocked out in the mine some 275,000 tons of a good grade of zinc-lead ore with an additional 200,000 tons of probable ore. Finally the property passed into the hands of the Colorado Mining & Milling Co., in which the Sunshine Mining Co. of Kellogg, Idaho, holds an interest. Acting for this group the Stiers Construction Co., with John Austin as superintendent, is driving an 8 by 9-ft. tunnel from the end of the old Treasury tunnel to connect with an 1100-ft. raise that will be driven into the orebody on the sixth level of the old Black Bear workings, where a large tonnage of blocked-out ore was left by the Walsh interests years ago. The new tunnel, described in *E. & M. J.* for Oct., 1943, is being driven at the rate of 800 ft. a month in spite of a man-power shortage and a heavy flow of 37-deg. waters. The Barstow tunnel, parallel to the Treasury tunnel and 3000 ft. north of it, is being opened to serve as a drainage tunnel and a ventilation bore. Work is progressing rapidly, and over half of the tunnel bore has been completed.

▶George Callaway is shipping ore to the Clear Creek Gilpin Sampling Works from the Trail Creek district. The concentrates run high in zinc.

▶West of Leadville, Ore and Chemical Co. completed its new, large heavy-media mill, and is now operating it, and southeast of town, Resurrection Mining and Milling Co. is doubling the size of its mill. The Resurrection is the only company mining new ores for milling, though it is also using dump ores to complete the mill tonnage pending greater development of ore reserves. Near the Resurrec-

A COMPLETE AIR PLANT



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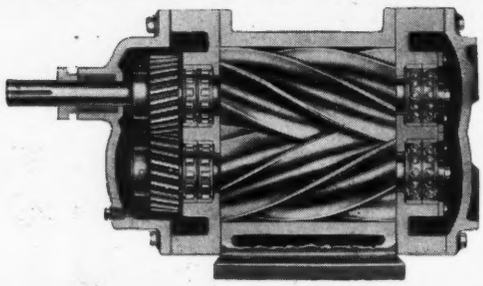

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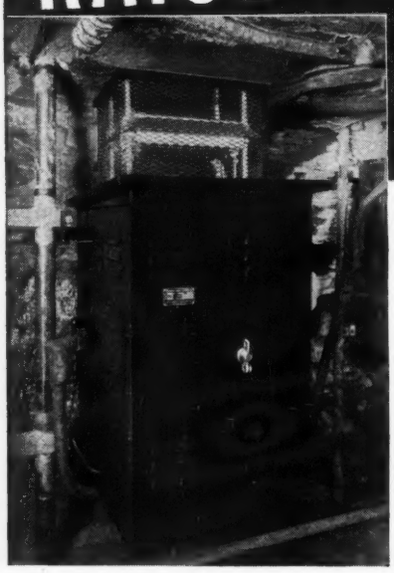

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Type KSC Sectionalizing Circuit Breaker

I-T-E

Representatives in Principal Mining Areas

CIRCUIT BREAKER CO.
PHILADELPHIA, PA.

Colorado *(continued)*

tion mill are the new California Gulch Mining and Milling Co. mills, operated by Mr. Harner, who was general manager of the Golden Cycle Mill at Colorado Springs for over 25 years. On the north slope of Carbonate Hill, above Stray Horse gulch, John Hamm is operating the Hamm Mining and Milling Co., Ltd., where he is completing a new jig plant that will double the size of his operation. The combined tonnage of mills in the Leadville section will soon eat up the large dumps that are now profitable to work, largely because of the new heavy-media process. The Resurrection Co., headed by Arthur Kendall, operates through the old Yak tunnel, which drains part of the old Ibex properties located at a higher elevation than many of the mines of the section. Over 150 men are at work, a total now being increased by the addition of released soldiers, and the mine is now producing over 1000 tons of zinc concentrates per month and 400 tons of lead concentrates. At the Hamm mill, the dumps from the famous properties of the Maid of Erin, the Wolftone, and the Adams mines are being drained of their remaining values of zinc, lead, silver, and gold. Mr. Hamm expects to treat over 750,000 tons of dump ores.

▶ A hoist from the Pewabic property has been installed at the Running Lode mine on the outskirts of Blackhawk, and E. Ritter of Denver, the engineer in charge, has had the power connected and other machinery installed, including a new gallows frame. This property, which has not been worked for many years, has a shaft 1100 ft. deep filled with water.

▶ The ghost town of Kokomo, north of Climax, has risen from its grave largely through the operations at the Wilfley mine, located in Searles gulch on Elk mountain about half a mile from town. This property, idle since the panic of 1907, has now become one of Colorado's leading producers of strategic metals. Headed by Jack Walsk, president, and C. G. Blaha, general manager, the mine entered production a year ago, and has been shipping 300 tons of zinc, 300 tons of iron, and 50 tons of lead concentrates per month. These tonnages will soon be doubled when 24-hr. operations are begun. About 70,000 tons of zinc ore are immediately available on three dumps of the old mine and 600,000 tons of zinc ore in sight in the underground workings. Due to the release of some soldiers for mine operations, together with the erection of a dozen trailer houses, the camp has assurance of continued operations, with ample housing facilities. The operations are carried on through the 2500-ft. Wilfley tunnel. It was before 1890 that A. R. Wilfley caused much excitement by consolidating a number of mines into a single operation, and began driving tunnels and removing ore. Wilfley continuously tried new mining and milling methods; among them were the roasting of the ores, and the attempted removal of iron by use of magnets, and the invention of the Wilfley table. Wilfley later sold his mining interests and spent his time with the concentrating table. Other operators

now helping to rebuild this famous mining center are the Lucky Strike mine operated by A. R. Rhine and shipping steadily, the Queen of the West mine worked by Walter Byron of Denver, and the Kimberly being worked by J. B. Ross and associates.

▶ The Valley Forge mine on Tower Mountain near Silverton has been opened on several levels by J. E. Dresbach, who is installing machinery at the lowest opening not far from the mill and highway. Dresbach expects to have this zinc-lead property in operation early this winter.

▶ Guy Pyle, superintendent of the Hardrock Mining Co., is maintaining a steady production of ore from the Nancy mine in Four Mile Canyon west of Boulder.

▶ Mill foundations have been poured at the Urad mine of the Molybdenum Corp. of America near Empire, and Southwestern Engineering Co. will erect the 200-ton mill for treating the molybdenum ore early this winter. Walter J. Eaton is general superintendent at Urad.

▶ Due to increases of surplus stocks of vanadium the U. S. Vanadium Corp. mine and mill at Rifle has reduced output 50 percent, and the 75 men released were offered employment elsewhere in the nonferrous mining industry. Other vanadium companies in the area will not be reduced in capacity at this time, due to their connection with a government program, which was not the case at Rifle.

▶ E. W. Creel of the Mickey Breen at Ouray states that the recent rich strike is broadening out and gives promise of a large mine. Further ore has been found in two places and a tram line is used to ship this ore.

▶ George H. Teal reports that the core drilling carried on last year by the Bureau of Mines and Geological Survey in the Sugar Loaf district above Boulder has led to the opening of additional tungsten ore bodies in the Dorothy, and a 12-in. vein is ready for production. Teal operates under lease the Dorothy-Katie and Princess-Gold Coin groups, also the Crete and Elsie.

▶ A shipment of two cars of zinc-lead ore was made about the middle of October from the Taylor Park district by John Lambertson and his son, Karl.

▶ Shipments are being made from the Stanley mine at Idaho Springs to the Huntington mill on Chicago Creek. Concentrates are going to the Golden Cycle mill at Colorado Springs.

WASHINGTON

Northwest's alumina plant still open issue—Metaline company reorganizes board of directors

▶ Metaline Mining and Leasing Co. has reorganized its board of directors with H. Louis Schermerhorn of Spokane, president. This has been done to prepare for an adjustment of the claim of American

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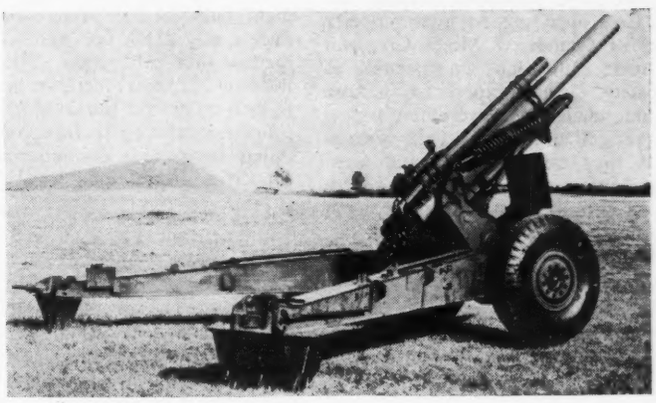

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Washington *(continued)*

Zinc, Lead and Smelting Co. against the Metaline Co. The former company holds 51 percent of the Metaline company's stock and has a claim against the Metaline company on which it is said $41,723 is due as interest on notes. Of the five directors who have been serving, four are officers or employees of American Zinc. Mr. Schermerhorn is the second largest stockholder. Dale I. Hayes, vice-president and general manager of American Zinc, will continue to be general manager of the Metaline company.

▶ Metaline is the most active mining district in the state. Metaline Mining and Leasing Co., operating its own property and that of Grandview Mines Co., and Pend Oreille Mines Co. are operating at full capacity. They expect to increase production when the government's new housing project at Metaline Falls is completed if they can get additional men. Metaline Mining and Leasing Co. is also developing a property a few miles north of Metaline Falls in the Slate Creek district, which it hopes will be an additional source of ore. Bonneville Power Administration has its eye on the Metaline district, and is considering running an electric line to serve those mines and some properties adjoining in northern Stevens County.

▶ Little Noisy is a scheelite property near Sullivan Lake, not far from Metaline Falls, which also is attracting some attention as a new enterprise. L. E. Boswick and associates, of the Ione district, are chief owners in the Little Noisy Mining Co. Men employed under Sheldon L. Glover, supervisor of the State Department of Mines, uncovered the scheelite. The known ore in the mine has been lead and zinc.

▶ Arthur Simonton, merchant and postmaster at Leadpoint, has sold the Electric Point mine near there to Kelly Lotz, who is taking out ore and stripping the ground. Simonton acquired the property about ten years ago by securing the interest held by the county and federal government.

▶ S. I. Serigstad of Minneapolis, president of Red Top Mining Co., recently inspected the company's holdings in northern Stevens County in company with J. Richard Brown, manager. They propose that the company shall confine its operations this winter to mining developed ore and piling it for disposition in the spring, when they may decide to build a mill or to ship the ore to the Bunker Hill smelter at Kellogg, Idaho. Mr. Brown says the ore is high grade running about 18 percent zinc, 25 to 30 percent lead, and 25 oz. per ton silver. The property has been opened by a tunnel a mile long.

▶ Whether the northwest is to get an aluminum plant is still unsettled, with contradictory reports following each other from Washington, D. C. Approval came Nov. 10 from Washington for an alumina-from-clay pilot plant near Longview, but it was stated that the granting of an urgency rating had not been secured. The committee held that it had not been advised that additional alumina is needed for the war effort, but Chairman George K. Comstock said the committee had no objection to such a plant if it can be operated by labor not otherwise employed for more essential work. In the meantime the U. S. Bureau of Mines has started drilling and expects to put down many holes to explore the clay deposits about 20 miles southeast of Spokane.

▶ The recent order of the WPB withholding federal aid from new marginal producers of certain metals has not had an important effect on operations in the Pacific Northwest. The order is expected to work both ways. Some owners may close their operations and release their men, but, on the other hand, big producers may get a few additional men to increase their production. H. P. Sherman, head of the government agency appointed to loan money for the development of new properties, says up to the present time no orders have come discontinuing work on properties already under way.

▶ Howe Sound Co. has announced its 16th quarterly dividend. It will be the fourth this year and will be paid Dec. 21. The disbursement will be 10c. a share, or a total of $148,822. Its properties are in the Cascade district and its ore is gold, copper, and tungsten. The company is also testing cobalt deposits in the Blackbird mine in Lemhi County, Idaho.

IDAHO

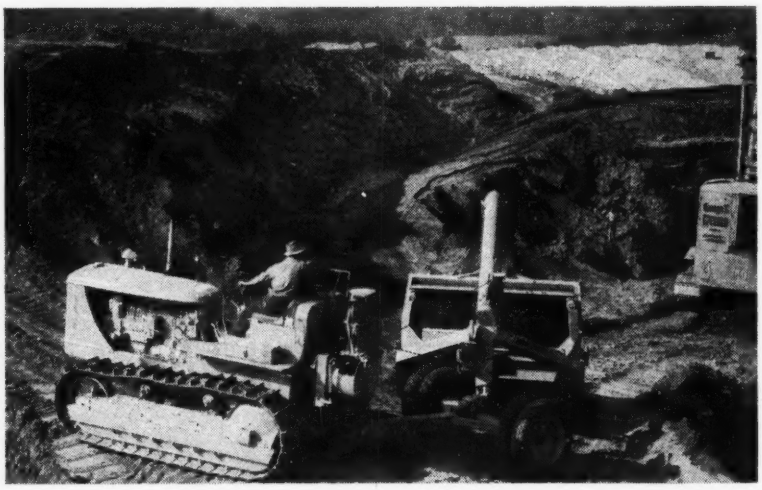
Federal reports new ore—Iron orebody found near Grangeville—Guggenheims buy Red Bird mine

▶ Federal Mining and Smelting Co., operating the Page and Morning mines in the Coeur d'Alenes, reports an important new ore disclosure on the 2300 level of the Page mine. The new discovery is a body of lead-zinc ore showing an average width of 8 ft. and assaying 35 percent in lead and zinc with the zinc predominating. The new ore has been opened by a drift for more than 100 ft. and is continuing in size and value. The disclosure is believed to be a continuation of the Tony vein which was cut off by a fault in higher levels. The Page mine is equipped with a 500-ton mill. Earnings for 1942 were reported at $780,277. The main working shaft is now down 2482 ft. About 250 men are employed at the property.

▶ Quarterly dividend payments in December by Coeur d'Alene district mines have been announced as follows: Bunker Hill & Sullivan, 25c. per share, totaling $327,000; Hecla Mining Co., 25c. per share, totaling $250,000; Sunshine Mining Co., 10c. per share, totaling, $148,882; Federal Mining and Smelting, 50c. per share, totaling, $123,320.

▶ Callahan Consolidated Mining Co., Wallace, operating the Rex and Monarch properties in the Nine-Mile section of the Coeur d'Alenes, has added a third shift to its underground crew. The company's new milling plant is now in full time operation.

▶ Henry Ford's Red Bird mine, located on Squaw creek near Clayton in central Idaho, is reported to have been sold to the Guggenheim mining interests. The Ford company purchased the Red Bird mine in 1925 through the recommendation of the late Robert N. Bell, for many years Idaho's mine inspector. The mine is said to have large tonnages of lead-zinc-silver ore developed but has not been in active production. Total development work is reported at 23,817 ft. The property consists of the Red Bird and Silver Rule groups, comprising 30 patented claims and five millsites in the Bay Horse district, 70 miles from the railhead at Mackay. The vein has been opened in the Red Bird group to a depth of 900 ft., the No. 4, or lowest level, tunnel cutting the ledge at 1680 ft.



STRIPPING overburden from a barite deposit mined by Wolf River Corp. near Jamestown in Fentress County, Tenn. The "barytes" occurs as coarse lumps and small stringers in a 30-ft. thick bed of clay derived from limestone

▶ Millions of tons of high grade magnetic iron ore are reported in a district about 12 miles from Grangeville, central Idaho, by Walter Hovey Hill, veteran mining engineer of that section, who has prospected the area with Philip J. Shenon, head of the regional office of the U. S. Geological Survey. "The iron croppings are magnetic," reports Mr. Hill. "The ore is an exceptionally high grade magnetite. It contains no sulphur, titanium, or phosphorus, but does include enough manganese, 2 to 3 per cent, to rank it in quality with Swedish iron of which armor plate is made." Estimates of the tonnage in these deposits are now being made by Bureau of Mines engineers, U. S. Forestry engineers, and U. S. Bureau of Roads officials. If preliminary tonnage estimates are satisfactory, the deposits will probably be drilled by the U. S. Bureau of Mines.

▶ National Copper Mining Co.'s property, north of Mullan in the Coeur d'Alenes, has been sold by vote of the stockholders to the newly formed King Mining Co. for 209,808 shares of the King company stock. The King company is taking over properties in the east end of the Coeur d'Alenes, long known as the "copper belt" but idle for many years. The Day interests control the new corporation.

▶ Prevention of collapse of the domestic economy was given as the chief argument for government stockpiling of metals in the postwar period in an address made recently by Donald A. Callahan before the North Idaho Chamber of Commerce in Kellogg. Mr. Callahan is president of Callahan Consolidated Mining Co., and in favoring the Scrugham stockpile bill, he voiced the views of Idaho's mining operators, according to Harry A. Marsh, secretary of the Idaho Mining Association.

Mr. Callahan expressed himself as fearing that if government-held stocks of metals and postwar accumulations of scrap metals were thrown bodily upon metal markets following the war, the mining industry would be brought to a standstill for lack of markets for its products, and that the resulting confusion and unemployment would have a bad effect on industry as a whole. He added that the health of the mining industry should be of particular concern to the nation because of the utter dependence in an emergency of our war machine upon the products of the nation's mines.

The continuance of premium prices after the war for a period long enough to return the capital investment of marginal operators was also urged by Mr. Callahan.

UTAH

Tunnel to be driven to aid mining Bingham pit's lower levels—WPB order reopens alumina plant

▶ Aluminum, Inc., was authorized on Oct. 29 by the RFC to resume work on the Marysvale plant, shut down early in October. Lifting of the stop order was author-

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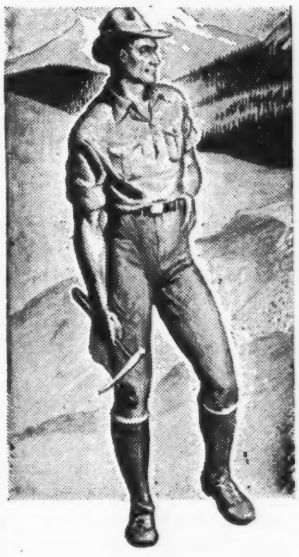

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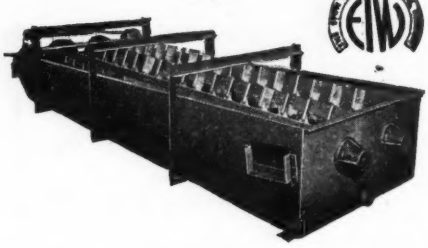

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Utah *(continued)*

ized by C. E. Wilson, vice-chairman of the WPB. The Marysvale plant is designed to test the Moffat process of extracting alumina from alunite.

▶ The non-ferrous mining industry still needs 1000 miners, A. G. Mackenzie, manager of the Utah Metal Mine Operators estimates. Mines are using women wherever possible. A total of 2526 men have been lost by the industry to the armed forces alone, Mr. Mackenzie said.

▶ New Park Mining Co. will pay a dividend of three cents a share on Dec. 10 to stockholders. Silver King Coalition Mines at Park City reports a net profit of $24,844.70 for the third quarter ending Sept. 30, 1943, before depletion and before federal income taxes of $6,811.78. Net profit for the year up to Sept. 30 amounts to $261,673.94.

▶ Operation of the new leaching plant of Ohio Copper Co. at the La Sal, Utah, Big Indian Copper property has been started with satisfactory results. Desert Tungsten Co. in the West Tintic district has obtained an additional $20,000 development loan from the RFC.

▶ Driving of a single-track, railroad size tunnel will be started by Utah Copper Co. at Bingham from the lower Bingham Canyon into the open pit mine. The 4500-ft. tunnel will provide long-anticipated facilities for moving ore from the lower levels of the open pit mine. Utah Construction Co., to which the contract was awarded, expects to start work about Jan. 1, 1944.

ARKANSAS

Arkansas Manganese strikes high grade boulder — Silver Hollow mine increases output

▶ Because of moderate weather, mining conditions in the Batesville-Cushman field have been good for the last 30 days. Production of ore was approximately 780 tons in October, most of which was high grade. Most of it was purchased by Metals Reserve at the buying depot at Batesville. A light demand has arisen for some of the lower grades. This ore is going direct to the furnaces.

▶ Silica Products Co., operating a large plant at Guion, is now in full operation. Their original plant was destroyed by fire over a year ago. Mertie Dunkin of Guion is in charge of operations. Sand is mined in large tunnels, a method which has proven more satisfactory than the old quarry method. The company also operates a plant at Everton in Boone County.

▶ Batesville White Lime Co., Lawrence Smith in charge, operating a big lime and stone plant at Limedale, are furnishing several hundred tons of lime a day to the aluminum plant at Bauxite, Ark. In order to take care of the increased demand, the company has installed a new crushing plant at their big quarry. The new crusher is a 32 by 40-in. jaw crusher, and is now breaking from 600 to 800 tons of limestone a day. It is driven by a 200-hp. electric motor. Crushed stone is carried from the crusher to a vibrating screen over a belt conveyor 215 ft. long, Stone over 3 in. goes into the lime bin, and undersize into the stone plant bin. The latter is used for the manufacture of calcium carbonate, ballast, and agricultural limestone.

▶ I. C. Watkins, formerly in charge of the Metals Reserve buying depot, has been called back to Batesville to take charge. Major Ruggles, who has had charge of the depot for several months, was called home recently because of illness in his family.

▶ Arkansas Manganese Co., headed by Jack Gibbons of Cushman, recently struck one of the largest boulders of high grade ore ever encountered in the field. It was found in a drift in one of their shaft operations on the Aydelotte property, and weighed 32 tons. Arkansas Manganese Co. produced 102 tons of high grade and 55 tons of low grade in October. Two new shafts and a newly installed washing plant are now in operation on the Aydelotte.

▶ Walter H. Denison Manganese Co. of Cushman, made a production in October that ran to about 200 tons, most of which was high grade.

▶ Charles Sims of Cushman, operating on the Waters and Turner properties, produced 60 tons of high grade and 50 tons of medium grade on the two properties in October.

▶ Par-Mar Engineering Co. is now installing a large beneficiating plant on the Bayou in Batesville. Operations are in charge of James Wood, operating engineer, and Max Cohen, work manager, both of Batesville. They worked out a process in a small pilot plant on the same site that brings the metallic value of low grade wad up approximately 10 points. The plant will also handle low grade carbonate ores. The process is a washing, screening, jigging, and sintering process. The sintering kiln will be fired with natural gas. The same company is carrying on hydraulic operations in the Lafferty Creek District near Cushman. These operations have been suspended temporarily because of lack of sufficient power, but present power facilities will be replaced as soon as possible.

▶ Hendricks Mining and Milling Co., operations in charge of A. C. Hendricks of Batesville, has a large washing and concentrating plant on the Polk-Southard mine near Cushman about 80 percent completed. This is one of the largest and most modern plants ever constructed in the field. The crude that will be handled by the plant is high grade ore disseminated in the residual clay of the Ferndale lime.

▶ Stanley Hanford, pioneer mining man of Batesville, has taken over the Winkle property about four miles west of Mount Pleasant in Izard County, and started production about Nov. 1. His best strike to date has been a 1½-ton ore boulder that

ran 55 percent. He is working on a high grade deposit.

▶ Miller and Fitzgerald of Batesville, in charge of operations of the Southern Hill Mining and Manganese Co., have been devoting a lot of time during the last six weeks to experimental work on beneficiating low grade ores. Their October production ran 10 tons high grade. They operate the Southern Hill mine near Cushman.

▶ Grace and McGee of Batesville, operating the Chin mine on Cave Creek, made approximately 200 tons of medium grade in October. The ore runs from 38 to 42 percent. They have their main tunnel back into the mountain now well over 300 ft. The ore vein lies between two bars and is about 17 ft. high and 30 ft. wide. They also operate two shaft and drift mines on the property.

▶ Stanley Bourne and Ernest Stroud of Batesville, operating the Austin property near Mt. Pleasant in Izard County, have the main drift from their shaft started at a depth of 60 ft. The shaft is down to 83 ft. Practically all of their ore is pyrolusite and is the largest deposit of this ore ever encountered in the field. The big problem confronting them at this time is separation and recovery.

▶ October production in the North Arkansas zinc and lead field amounted to about 40 tons. November production however, will run about 120 tons. There will be no new government loans to operators in the field and new operations will have to be conducted with private capital.

▶ Silver Hollow Mining Co. operations now in charge of Alvin Wright of Yellville, operating the Silver Hollow and Silver Queen mines in the Rush Creek District, have made some changes in operating equipment which increased production. Changes in mine tracks and hoisting equipment, and the installation of two new rolls in the mill have increased mill output. The mill is now running four days a week instead of two, and turning out 9 percent high grade sulphide concentrates from the crude. One car was shipped early in November and another will be shipped before Dec. 1.

▶ Hall Mountain Mining Co., operations in charge of J. C. Jones of Yellville, will ship a car of high grade carbonate early in November. This was recovered from exploratory operations on the Truex mine. Some good faces of carbonate have been opened up as well as some sulphide. Operations are progressing satisfactorily.

▶ Moark Mining Co., operating the Almy, Jackpot, and other properties in the Zinc district, is operating steadily and will probably have a car of zinc silicates in the bin by the last of November. Operations are in charge of C. T. Rabineau of Zinc.

▶ The U. S. Bureau of Mines is now back in the field doing test drilling. They have three sites selected: one at the Hurricane mine in Searcy County, where they are now working; and two at the Speer and Coon Hollow. Drilling is being done with churn drills. They have struck some carbonate ore at the Hurricane, but have as yet released no drill records. Work is

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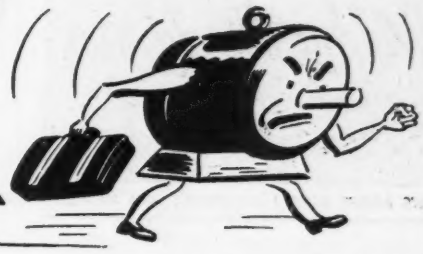

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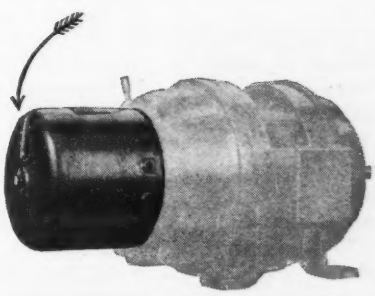

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Arkansas *(continued)*

in charge of R. B. McElwaine, project engineer. Other men from the Little Rock office of the Bureau are also in the field. T. M. Romslo made field inspections and Felix Vogel is investigating a large deposit of iron pyrites near Berryville in Carroll County and also looking over other iron prospects that might be needed in the post war program.

TRI-STATE

Fire delays Oronogo dewatering job—Dalite Mining Co. to open new pit—Pilot Oil Resumes

▶ Dewatering of the Oronogo mining field was delayed somewhat when, on Oct. 31 fire of undetermined origin destroyed the No. 15 pump station of Eagle-Picher Mining & Smelting Co. at Oronogo. Two large turbine pumps, a 16-in. with 18-in. discharge and a 14-in., were being operated at the station in dewatering the area which was flooded last May. Although two large electric motors powering the pumps were destroyed as were transformers and transmission belts, the pumps were not damaged beyond repair. Emergency crews immediately rebuilt the pump station structure and installed new equipment. With the exception of low places and underground sumps, the company had just completed the dewatering of the Oronogo mines, preparatory to the resumption of mine operations in the lower working levels of the area. Five 10-in. and a 14-in. turbine pump operating at other points in the Oronogo field held the inflow of water while the two large pumps were down. The 14-in. pump at the No. 15 station was placed back in operation within a week, and the larger pump was running a few days later.

▶ St. Louis Smelting & Refining Co. has completed the sinking of a new shaft on the old Gascho lease of C. T. Orr in the Waco mining field, according to Howard H. Utley of Baxter Springs, district agent for the company. The shaft was put down to the 245-ft. level where an upper run of ore is being mined. A derrick and hopper was moved from the company's No. 4 shaft on the High Five lease, which adjoins the Gascho lease on the west. Both leases are on the Missouri side of the Kansas-Missouri line. A drill hole for the installation of a large turbine pump of 1,500-g.p.m. capacity is to be put down near the shaft to dewater the ground to a lower level ore body. It is planned to sink the shaft later to the 350-ft. level, according to Gloyd Wiles. An old shaft near the new mine development on the lease is being repaired and reopened to provide improved ventilation underground. The company also is carrying on mine operations on the old Grasselli and Freehold leases in the Waco area, ore from which is treated over its No. 9 mill on the Kansas Side of the line.

▶ Purchase of the Velie Swalley mine of Mineral Products, Inc., by Beck Mining Co. effective Nov. 1, was announced by R. H. Beck of Miami, manager of the latter company. It is situated on the Swalley land south of the Baxter Springs cemetery near the Beck company's Smith mine. The Velie Swalley mine was first opened by the old Velie Mines Corp. about five or six years ago, and was reopened and has been operated the last two years by Mineral Products, which was backed by Pittsburgh interests. Equipment at the mine included derrick-hopper and large compressor, with electric power installations. Mine operations will continue to be carried on around the 300-ft. level, and ore will continue to be shipped to the Beck No. 3 mill on West Nineteenth street in Baxter Springs for treatment, Beck said.

▶ Preparations are being made by the Pilot Oil Co. to resume operations at its mill and mines northwest of Baxter Springs, Arthur Ward, company superintendent, reports. The properties were shut down nearly two years ago, during which time some churn drilling was done on the Skelly land, on which the mines are located, and a 335-ft. tramway incline was built from the mill hopper on the Morrison land to the No. 2 Skelly shaft and later extended to the No. 1 Skelly shaft. The mill, which has a capacity of about 25 tons an hour, is that of the old Otis Mining Co. P. Q. Proctor of Tulsa is manager of the Pilot company.

▶ Beverly C. Platt, Kansas City business executive, and associates have organized the Lucky Five Mining Co. and are reopening the old Lucky Five mine on the Davis land northwest of Duenweg, a short distance south of the old Scott mine. The old Lucky Five mine shaft, which was sunk about 35 years ago, has been recribbed and the underground workings have been dewatered. According to Leonard Cruzan, superintendent in charge of operations, the old mine has six different headings of good zinc-lead ore faces in virgin ground on the 150-ft. level.

There also is another minable level at a depth of 135 ft., he said. The company has a lease on 60 acres of the Scott land. Ore will be trucked to the Rees mill near Joplin.

▶ Dalite Mining Co. has completed the development of an open-pit mine on the Harder land south of Alba, and has started milling ore from the mine over the former Barkey small tailing retreatment plant, which has been revamped and enlarged for the treating of mine ore. The mill, which has a capacity of 400 tons daily, is situated on the Shaunce land just north of Alba. The open-pit development is situated on 12 acres of the 45-acre Harder tract, and is near the old Westside mine, which was sunk to the 200-ft. level 62 years ago. Some shallow mining was done on the tract in 1915, and subsequent churn drilling showed two runs of zinc-lead ore, one from the 6 to 22-ft. levels and the other from the 32-ft. to the 85-ft. level, according to H. J. Bradley of Webb City, company manager and partner. The company is backed by Council Bluffs, Ia., business interests.

▶ Several Tri-State mine operators were

invited to serve as members of the Midwestern Zinc Mining Industry Advisory Committee and to attend a joint meeting of this committee and the eastern and western groups of the same name. The initial meeting was scheduled to be held Nov. 12 in Washington, with James Douglas, head of the WPB zinc division, as chairman, but was postponed to a later date.

MICHIGAN

Michigan copper country nears centenary with four companies still operating

▶ The Michigan copper district will observe its centenary of mining in 1944. One hundred years ago, following a Federal treaty with the Indians, who relinquished their claims to the land, hundreds of prospectors rushed into the district in search of copper and silver. The government issued permits to cover tracts of land three miles square, but later reduced these to one mile square. Nearly 1,000 of these tracts were taken up and recorded. Most of the prospecting was done in the vicinity of Copper Harbor, where some mining was done in 1844.

▶ The first successful mining was at Cliff, owned by the Pittsburgh and Boston Co., which was opened in 1845. The Cliff, working on fissure veins, in which mass copper was found, was the first dividend payer in the district. The Minnesota mine in Ontonagon County was opened on a fissure in 1849 and became a dividend payer in 1854, followed by the National mine, in the same region, with a dividend in 1861. The Central mine, operating on the Central fissure, northeast of the Cliff, was opened in 1856 and began paying dividends in 1864. All of these mines were noted for their heavy mass copper, several of the masses weighing as much as 500 tons each.

▶ The first successful mines on an amygdaloid lode were the Pewabic and the Quincy, which were opened on the Pewabic bed in the Portage Lake region, in 1856; both mines began paying dividends in 1862. Quincy absorbed the Pewabic in 1891. The Isle Royale mine, also in the Portage Lake area, was opened in 1852 and was worked intermittently by a number of companies in the succeeding years; it yielded no dividends until 1913. Atlantic was discovered in 1864 and intensive development was started by Atlantic Mining Co. in 1872. Atlantic also was a dividend payer.

▶ The famous Calumet & Hecla conglomerate was opened in 1864, and the company paid its initial dividend in 1869. During the 73 years of life of this vein, 3,725,000,000 lb. of copper was produced. With this rich deposit, Calumet was the center of the copper mining industry for many years. It paid its shareholders approximately $200,000,000 in dividends.

▶ The Baltic lode was discovered in 1882,

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Michigan *(continued)*

but remained undeveloped for 16 years. The Baltic mine was opened in 1898, and the Trimountain and Champion mines the following year. All became dividend payers. Baltic and Trimountain suspended about 15 years ago, but Champion is still one of the important mines of the district. The Champion is the property of Copper Range Co.

▶ The present operating companies are Calumet & Hecla, Copper Range, Quincy, and Isle Royale. Calumet & Hecla is operating the Ahmeek mine and is developing new properties at Allouez, Ahmeek, and Central. Copper Range is extending the life of the Champion mine through the Globe property and also has started the development of the White Pine tract in Ontonagon County. Practically all mining land in the Michigan field is owned by these four organizations. Calumet & Hecla's holdings are mainly in Houghton and Keweenaw Counties; Copper Range owns properties in Houghton, Ontonagon, and Keweenaw Counties, while Quincy and Isle Royale are mining on their original tracts.

IRON COUNTRY

New installations complete at Sunday Lake mine—Oliver Iron prepares to mine Fayal No. 2

▶ Iron ore shipments from the Lake Superior district up to Nov. 1, 1943, were 8.52 percent behind those at the same time last year. Shipments in October, however, set a new record for this particular month. To meet this year's quota, set earlier by the WPB, there will have to be shipped from Nov. 1 approximately 9,750,000 tons. Freezing weather is creating a difficult problem at present, and weather alone will determine whether or not the quota will be met. Consumption of iron ore amounts to about 7,500,000 tons per month. At this rate, there will still be stockpiles at the furnaces of between 10,000,000 and 15,000,000 tons when navigation opens next spring.

▶ With the close of navigation for 1943 imminent, most of the large producing mines of Minnesota are now on a winter program of development and repair work. Stripping overburden and moving rock will consume most of the time available until navigation reopens. The expected heavy demand for ore from this region next year requires that as much development as possible be done during the winter.

▶ Oliver Iron Mining Co. is making preparations for stripping the Fayal No. 2 mine at Eveleth. It is hoped that this property will enter production in 1944, using trucks to handle the ore. Dewatering the Fayal No. 3 mine is now under way.

▶ Delta Chemical and Iron Co., operating since 1922 at Escanaba, Mich., has decided to discontinue making of charcoal iron. It was necessary to close the furnace when average production could not be maintained for lack of charcoal caused by a scarcity of both wood and labor. It is not likely that iron production will be revived here in the postwar program. Another charcoal iron producer, Antrim Iron Co. of Antrim, Mich., producing since 1884, has terminated operations for the same reason. Attempts are being made to move these facilities to Mexico or South America. The only furnace now producing Lake Superior charcoal pig iron is located at Newberry, Mich.

▶ A recent report from David Hagberg, mine inspector for Dickenson County, Mich., covering the period from Sept. 1, 1942, to Sept. 1, 1943, shows how ore mining has decreased in that section of the Menominee range. Of the 22 active mines in the past, only four are now operating with a total yearly production of 595,000 tons. These are Central Vulcan, Curry, Bradley, and Cornell mines, with Curry mine of Penn Iron Mining Co. leading with 150,560 tons. These mines employ 496 men, and two of them are underground producers operating 12 months per year.

▶ At the Brotherton shaft of the Sunday Lake mine, Wakefield, Mich., Pickands, Mather Co. has just completed installation of buildings and equipment designed to modernize the mine in all departments. Including this season, the mine has operated 58 years and these improvements indicate a long future life. With all new construction of steel, brick, concrete, and glazed tile, there is little danger of loss by fire or obsolescence. The steel headframe, as well as the belt conveyor to railroad pocket, were salvaged from the old shaft, but the shops, office, change house, and warehouse have been arranged into a unit under one roof and are built of red brick outside with yellow glazed tile brick inside and are also air conditioned to bring them strictly up to date. The hoist and compressor house of red brick is a separate building to the south of the shaft. The double-drum hoist is a steam machine from the old Yale mine, rebuilt for electric drive and equipped with a 1000-hp. motor. This operates two 6-ton skips in balance from an incline depth of 2300 ft. A new system of remote control is being used on the top tram, where standard haulage locomotives pulling 90-cu.ft. cars are operated from a control room near the top tram receiving bin. With this combination, the top tram operator does not ride the locomotive. Only a short shut down was necessary in changing over to the new shaft. D. B. Cavin is superintendent at the Brotherton shaft for Pickands, Mather Co.

▶ Work is now in progress to remove the iron ore from the sunken steamer G. M. Humphrey, sunk in about 100 ft. of water off Mackinaw City, Mich. Divers were used to remove the hatches and decks and the barge Leona with a steam clam shell aboard is used to remove the ore. John Roen, Sturgeon Bay, Wis., has the contract to raise the steamer but this will not be undertaken before spring even if removing the ore is completed before winter sets in and puts a halt to the salvage operation.

ALASKA

Gold sought on Kodiak Island—Placer regulations eased—Molybdenum found on Chog River

▶Red River Mining and Development Co. will explore for gold, platinum, and titanium on Kodiak Island where the company has 360 acres in a glacial area of 1,200 square miles. The ground extends from Karluk to Olga Bay. The debris is said to show platinum in a ratio of 1 to 15 of gold. F. J. Jenkins, Raymond Redfield, and Howard Keeler will further explore the region to discover the source of the glacial deposit. They will locate strategic minerals, and if the investigations seem to warrant it, a dredging or dragline operation will be installed. The climate is said to be such that year-round operations may be conducted.

▶B. D. Stewart, commissioner of mines for Alaska, reports an easing of the regulations for placer mining in the Territory which he believes will result in heavier gold mining in the coming seasons. One important amendment provides that placer miners who have obtained permits need not renew these permits each year. Heretofore, a placer operation could not be conducted if more than five men, including owner, are employed. This is now enlarged to seven men. The provision continues that no man shall be employed unless, because of age or other physical handicap or other reason, he cannot be used in essential war activities.

▶C. P. Morgan and Fred D. Hougham report that not more than 16 men were employed in the Cache Creek district in 1943, because owners found it very difficult to secure miners. Mr. Morgan has been mining on property formerly owned by Cache Creek Dredging Co., and reports that his small operations were profitable. Mr. Hougham holds 6,000 acres of placer ground on benches above the creek. He employed five or six men but hopes to have a larger force next year.

▶The wage dispute of Alaska Juneau Gold Mining Co. has been heard and a compromise decision rendered and forwarded to the National War Labor Board for a final verdict. This is said to be the first wage dispute in Alaska considered by the panel plan. The Mine, Mill and Smelter Workers' Union asks for an increase of 30c. an hour. A. B. Cain, chairman of the panel, representing the public, and George Ford, representing labor, recommended granting a 10c. increase. Albert White, representing industry, dissented.

▶It is expected the WPB will establish headquarters in Juneau, and that Norman C. Stines, a pioneer in Alaska mining, will be placed in charge. He already has been named for that position, subject to the establishment of the office, and will have charge of all WPB work in the Territory, including the handling of priorities, redistribution, and salvage.

▶Fifteen geologists under John C. Reed

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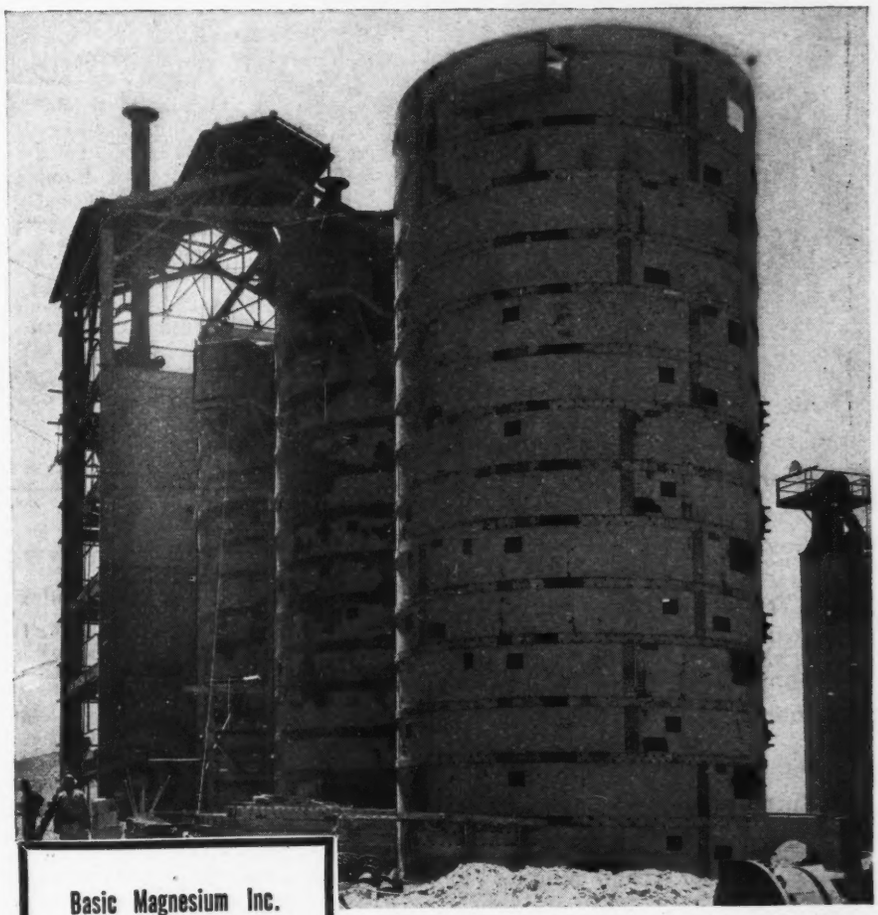

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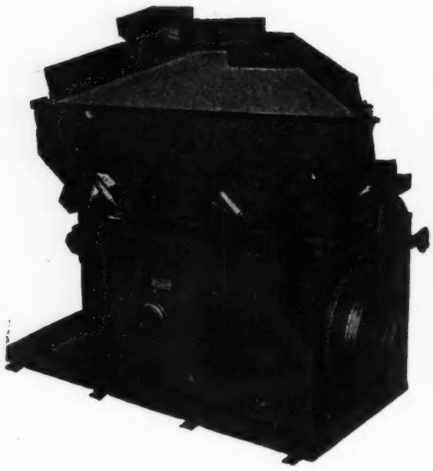

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Alaska *(continued)*

and William S. Twenhofel of the U. S. G. S., are working in southeastern Alaska. G. D. Robinson and R. A. Harris are making a survey of zinc deposits in the Moth Bay and Wrangell areas. L. A. Warner, with R. G. Ray, S. P. Brown, Phil Wagner, and C. T. Bressler, are surveying the Kassan district; and H. R. Gault, D. L. Rossman, Art Lachenbruch, George Flint, Matt Walton, and George C. Kennedy are making surveys of Baranof Island and Union Bay. Mr. Reed and Mr. Twenhofel have gone to the east coast of Prince of Wales Island to conduct this work.

▶ Harry Brink and John Hill, who have been alternately prospecting and mining in Alaska for 30 years, have located molybdenum ore on Chog River, a tributary of the Kuskokwim. Brink says he discovered this ore in 1933 but did not then know it had any value. This season he took Hill with him and after five days' prospecting on the mountain they discovered the vein.

▶ Neal Muir, of the U. S. Bureau of Mines, has been exploring for zinc and antimony in the Kantishna district, and has returned to Fairbanks. Harold C. Pierce and Bruce Thomas are studying for the Bureau the Shafer cinnabar property on the Holitna River.

CANADA

Manpower shortage still hinders industry—C. I. M. M. holds western meeting

▶ The subject of available labor has been the greatest concern of the Canadian mining camps since the fall of 1939, but it now appears that conditions are beginning to improve. Many closed mines and an almost universal reduction in tonnage have taken place from Nova Scotia to British Columbia. Siscoe Gold Mines in Quebec appears to be the single exception to the lowered schedule and continues to hoist the capacity, 1,000 tons a day. Farmers and French colonists have generally eased the situation by working six months out of the year in nearby mines. The number of men available this winter may be more limited, due to the higher wage scale allowed men working in lumber camps and cutting pulp wood, but the industry has a voice at the capital as a result of the appointment of a mining man as advisor on mine labor to the National Selective Service at Ottawa. The labor shortage has been responsible for lower tonnage not only at the gold mines but at the nickel, copper, and zinc mines as well. Selective Service holds the responsibility of issuing permits for the moving of miners to other jobs that are less important to the war effort.

▶ The labor shortage has delayed the opening of new properties, as well as cutting down the output of established base-metal mines. Almost without exception, Canadian base-metal operators are working below capacity although recent legislation has been designed to hold miners at their present jobs and to increase the number of men available. What has been described as the most important discovery of tantalum in world mining history is included with announcement of important discoveries of lithium and beryl. Production has started at Dome's promising molybdenite property in northwestern Quebec, and the output of magnesium from the Ontario plant west of Ottawa is increasing.

▶ This season has brought about renewed staking activity in northern Ontario and northwestern Quebec. It is reported that Teck-Hughes and McIntyre have been active in acquiring claim groups within the mineral belt from Rouyn all the way eastward to Cadillac township, which has recently been staked solid. Gold values were secured in recent drilling on the Hosking-Cockeram claims at the big bend of the Kinojevis River, including an intersection of feldspar porphyry similar to the Kirkland Lake formation, but exploration along this section of the Quebec belt is expected to be a long process, due to the heavy overburden.

▶ Announcement by the WPB in Washington that a plant will be built in South Carolina to utilize the Ancor process as an advanced method for the production of alumina from clays, indicates that another Canadian organization, Ventures, Ltd., has made a valuable contribution in the field of light metals. Canadian and U. S. government agencies have cooperated in developing this new process to the commercial stage. Sponsored by the Ventures subsidiary, American Nepheline Corp., F. R. Archibald carried on early experimental work at the laboratory of Beattie Gold Mines and much of the equipment was furnished by the Metallic Minerals Branch of the Bureau of Mines at Ottawa. A program was later undertaken to prove the process by utilizing a test shipment of clay and limestone from South Carolina in a pilot plant assembled at Ottawa. This research program has been successfully worked out.

QUEBEC

▶ W. McKenzie, president of St. Lawrence Mining Corp., has announced that exploratory work on the Beauchastel property has been completed and a program has been laid out for testing the newly acquired claims in Malartic township. The company is securing steady output of amber mica from its property near Kilmar, located about ten miles north of the Ottawa River at a location 60 miles east of Ottawa. The property in Beauchastel township was taken over for a stock interest from Chibmac Mines.

▶ The newly developed No. 2 mine at Malartic Gold Fields shows ore reserves adequate to support mill capacity of 1,500 tons a day. Due to the labor shortage, it has not been possible to proceed with the proposed expansion program and government restrictions have reduced production from the No. 2 area to 12 per-

cent of capacity of the 600-ton mill. While maintaining mill feed from the No. 1 mine, development of the larger area to the west has been proceeding on three levels. The average grade is reported to be $8.85 a ton, with gold valued at $38.50 an ounce. The contact zone between the No. 1 and No. 2 shaft areas will be tested after the long drift has been completed on the 1,250-ft. level. Ore reserves have been indicated in excess of 4,500 tons per vertical foot. Production in the third quarter was $350,128, with recoveries averaging $6.42 a ton. J. P. Norrie is general manager and Dr. R. Halet is mine manager.

▶Production has been increased to 300 tons daily at West Malartic Gold Mines, following a period of reduced output. Recovery is averaging about $7.00 a ton. It is proposed to deepen the shaft to make possible opening up two or more new levels. A new ore lens has been partially developed on both the first and third levels, east of the shaft. Changes in the mill have resulted in improved recoveries. A higher grade has been developed in recent stoping operations. There has recently been some improvement in the labor supply, which has made it possible to step up the mill rate.

▶A diamond drilling program has been started on the property of Norbenite Malartic Mines, located north of Marbenor Malartic, under the supervision of J. P. Norrie, general manager. A geophysical survey will be depended on in locating the drilling since this area is generally concealed by overburden.

▶Thurbois Gold Mines, one of several companies carrying on exploratory work in Destor township east of the Beattie mine, has reached a depth of 300 ft. with a diamond drill hole and reports intersecting heavy mineralization in addition to a 9-ft. section that averaged $5.60 per ton in gold. An extensive program has been laid out and it is reported that a second drill outfit is being moved to the property. The president is Robert Slusky.

▶Noranda Mines will increase dividend disbursements to $89,733,735 with payment of $1.00 a share on December 15th, making the total paid this year $8,959,038. In the first nine months of this year the mine has produced $7,799,060 in gold, compared with $7,437,160 in the same period a year ago. Although wartime conditions have seriously broken into the operating organization, Noranda has been successful in maintaining production. World's largest producer of selenium and the second largest producer of copper and gold in Canada, net profit in the first half of this year amounted to $5,664,500. There has been no publication of ore reserves since 1939, but it was stated in the annual report last year that production from horizons above the 2,975-ft. level could maintain the present mill rate for 15 years. H. L. Roscoe is vice-president and general manager.

▶A new program of exploratory drilling on the property of Dempsey-Cadillac Gold Mines has been negotiated with New York interests through the payment of $5,000 on an option that will provide

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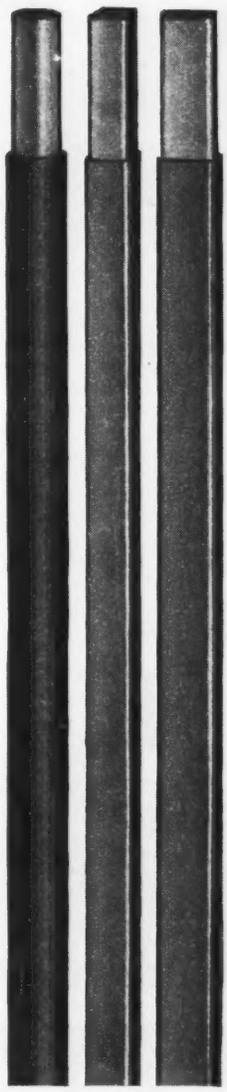

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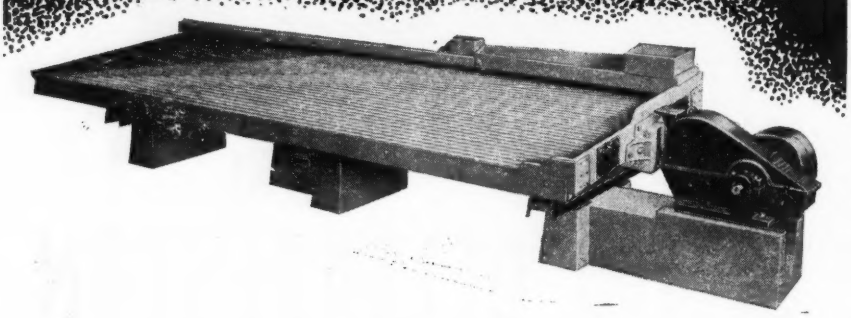

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FINDLAY, OHIO

Canada *(continued)*

the treasury with $50,000. This property adjoins West Malartic Gold Mines on the south and east and was explored by means of diamond drilling and shaft sinking to a depth of 275 ft. in 1936 and 1937, in the southern part of the property along the Cadillac "break". Subsequent development on other properties in the Malartic camp has indicated ore measures lying some distance to the north of this main regional structure and the present program is aimed at this area.

ONTARIO

▶ Production of Ontario's gold mines during the first nine months of 1943 was well below the same period of 1942, according to a report of the Ontario Department of Mines. In the 1943 period, 6,203,926 tons of ore was milled and 1,592,081 oz. of gold and 243,188 oz. silver were extracted. Value of this output was $61,386,620. In the same period in 1942, the figures were; 8,140,227 tons milled, 2,006,004 oz. gold and 331,356 oz. silver extracted, value represented, $79,438,092. This is a drop of 23.8 percent in ore milled, and a drop of 22.7 percent in value produced.

The figures for September show, furthermore, that the recession is continuing. Since the beginning of the year, eight mills have closed down. These were: Naybob, Moneta, and Hoyle (because of fire) in Porcupine; Yama in Larder Lake; Regnery in Algoma; Jerome in Matachewan; Uchi in Patricia; and Wendigo in Kenora. The 42 mills still producing are operating at only 63 percent of capacity, a circumstance due largely to shortage of manpower. During the first eight months of 1942, 17,250 men were employed in Ontario gold mines; in the same period of 1943, employment dropped to 12,561.

▶ Kerr-Addison Gold Mines, regarded as the foremost gold property to be developed anywhere in the past 25 years, continues to be handicapped by a shortage of labor but is maintaining a mill rate of about 1,600 tons a day. A main development way is being driven on the 2,500-ft. level, the lowest level to be developed being at 1,450 ft. In running this deep drive several intersections of spectacular ore have been made. By the end of the year it is expected to have information available for appraising the distribution of ore at this new deep horizon.

▶ Hollinger Cons. Gold Mines is reported to be operating at 60 percent of normal capacity, averaging about 3,000 tons a day. Production at the subsidiary Kam Kotia property is also reduced to 500 tons a day. John Knox is retiring after 20 years as general manager to become consulting engineer for Hollinger and subsidiary companies, including Labrador Mining and Exploration Co. His place is being taken by E. L. Longmore, who is being released by Wartime Metals Corp.

▶ McKenzie Red Lake Gold Mines is developing the northeast section of the property at the 1,250-ft. horizon, where

a major extension of ore reserves has been indicated. There has been an indication of the existence of large orebodies in this section of the mine, but only limited exploration has been possible under restricted labor conditions. M. F. Fairlie, managing director since 1935, has resigned as a result of other duties that prevented his regular inspection trips to the property.

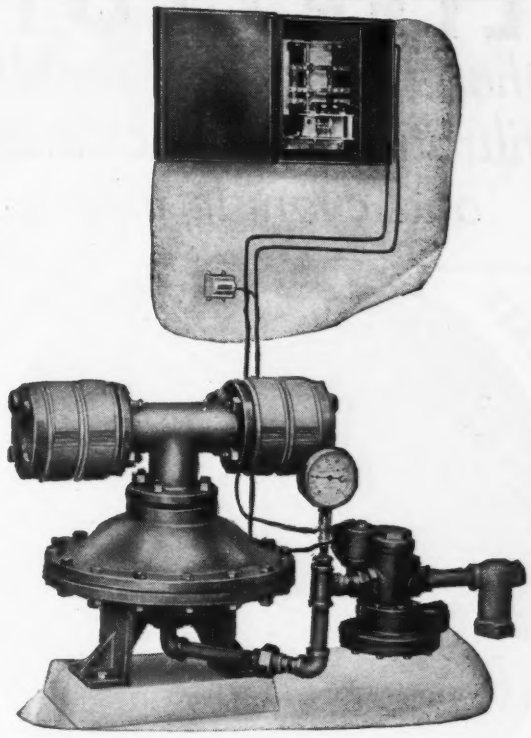
▶ Leitch Gold Mines reports lower earnings in the third quarter as a result of treating a lower grade ore. Production during the period was 6,881 tons valued at $196,378, averaging $28.54 a ton. Net earnings after all charges were $57,099. Recovery during the previous quarter was $34.14 a ton, with net earnings at $70,342.

BRITISH COLUMBIA

▶ More than 300 members and interested parties attended the annual western meeting of the Canadian Institute of Mining and Metallurgy, which concluded at Vancouver Nov. 19. Diversified papers presented a wide field for discussion in which the meeting freely indulged. Principal stress was laid on post-war rehabilitation and the part of the mining industry therein. Several speakers dealt with the development of northwestern Canada, and expressed the opinion that the anticipated expansion would play a leading role in post-war reconstruction.

▶ In sharp contrast with former meetings, only two papers were devoted to geological studies. There were also two metallurgical papers, both contributed by the British Columbia chapter, American Society for Metals, under whose auspices one session was conducted. One excellent paper on international labor unions attracted widespread discussion. Two papers dealt with mine operation. Following the initial success of last year, another session was devoted to conservation and salvage with contributions from the master mechanics of most of the leading western operations. To this was added a session on labour-saving devices, with representatives of leading mine-machinery manufacturers taking part. The meeting this year attracted more than ordinary attention, principally because it was the only meeting of the Institute in Canada. The register disclosed that visitors were present from all parts of Canada and the United States.

▶ In keeping with established practice on former occasions, British Columbia mining companies subscribed liberally to the Fifth Victory Loan. Consolidated Mining and Smelting Co. purchased bonds to the value of $8,000,000; West Kootenay Power and Light Co., a wholly-owned subsidiary, invested $750,000. The Pension Fund Societies (C. M. and S.) of Trail and Kimberley subscribed $400,000. Other leading subscriptions were: Howe Sound Co., for the credit of Britannia Mining and Smelting Co., $500,000; Premier Gold Mining Co., $150,000 Silbak Premier Mines, $100,000; Granby Consolidated Mining, Smelting and Power Co., $100,000; Sheep Creek Gold Mines, $100,000; Pioneer Gold Mines of B. C.,



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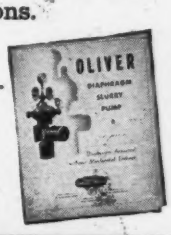

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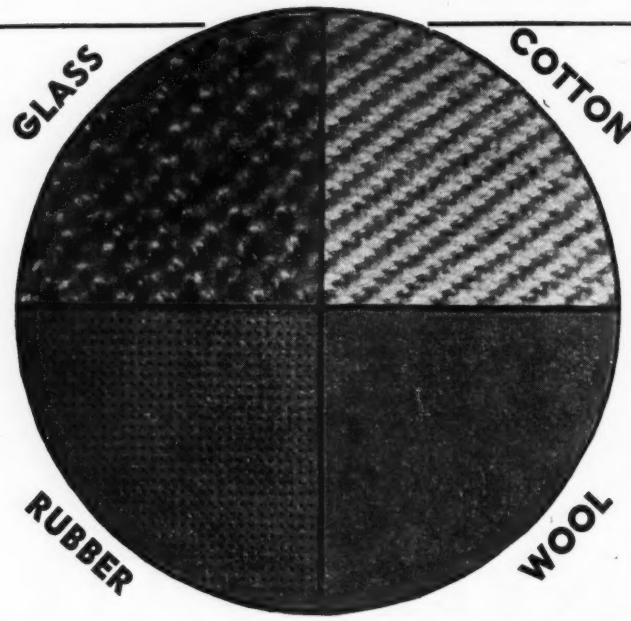

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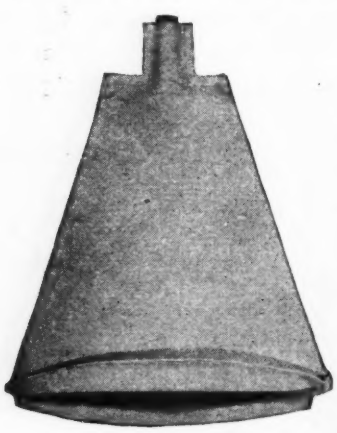

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Canada *(continued)*

$100,000; Privateer Mine, $85,000; Grandoro Mines, $25,000; and Surf Inlet Consolidated Gold Mines, $10,000.

▶ Silbak Premier Mines, Ltd., Portland Canal district, obtained net smelter returns of $83,749 for October production recovered from the treatment of 6,850 tons, averaging 0.31 oz. gold and 4.43 oz. silver per ton. Estimated operating profit was $38,546, before writeoffs.

▶ Even the limited development programme conducted by Silbak Premier on the adjoining property of Premier Border Gold Mining Co., Ltd., has been productive of a consistent profit throughout the past year. All profits are credited against costs returnable before allocation of profits under the agreement between the two companies.

▶ During the fiscal year ending June 30, Surf Inlet Consolidated Gold Mines, Ltd., Skeena district, experienced a net operating loss of $71,750, after provision of $17,636 for depletion and depreciation, and $25,775 for extraordinary expense attributable to the closing of operations after the first five months of the year. Robert L. Reed of New York, president, has advised shareholders that it is the intention of directors to re-open the Surf Inlet mines just as soon as normal conditions return.

▶ Although mining was suspended at the Zeballos district property of Privateer Mine, Ltd., in September, shareholders received a dividend of one cent per share on Nov. 10. Furthermore, directors have intimated that owing to the excellent cash position of the company a further disbursement is likely in 1944. Privateer has been obliged to defer development of the Iceland Spar group in the Kamloops district until next spring, when the property can be more easily reached.

▶ October production of Cariboo Gold Quartz Mining Co., Ltd., was 1,021 oz. gold, valued at $39,308, from 2,115 tons, averaging 0.48 oz. gold per ton.

▶ Island Mountain Mines Co., Ltd., Cariboo district subsidiary of Newmont Mining Corp., will pay a dividend of 2½c per share Dec. 20 to shareholders of record Nov. 19. This brings to 7½c per share disbursements during the current year, which compares with 13c. in 1942, and 18c. in the record year of 1941. October production was 673 oz. gold, valued at $25,895, from 1,714 tons, averaging 0.39 oz. gold per ton.

▶ During the first quarter (ending August 31st, 1943) of the current fiscal year, Sheep Creek Gold Mines, Ltd., produced bullion valued at $14,140. After operating costs of $42,030, and provision of $19,793 for taxes, $8,000 for depletion, and $2,600 for depreciation, net operating profit for the quarter was estimated at $44,758, equivalent to 2-2/5c per share. The wholly-owned subsidiary, Zincton Mines, Ltd., operating in the Slocan district, received smelter returns of $142,116 from the shipment of lead and zinc concentrates during the same period. Estimated profit, before provisoin for Domin-

ion taxes, which are now under review by Ottawa authorities, was $55,157.

▶ Gold Belt Mining Co., Ltd., for several years a successful operation in the Sheep Creek area of the Nelson mining division, has been compelled, as a result of the labor shortage, to suspend production for the duration. During recent months a policy of intermittent operation of the mill and concentration of all hands on underground development was adopted, but available labor proved to be inadequate for even this. The closing of Gold Belt reduces to eight the number of operating gold mines in the Province. There were 25 in 1941.

▶ Distribution of 8.4c per share in the form of a return of capital, as authorized by federal tax authorities and recommended by the board of directors, has been approved by the shareholders of Ymir Yankee Girl Gold Mines, Ltd., former Nelson district gold operator. The payment will closely follow the distribution of 1.6c per share in the form of a dividend and brings to 18c per share aggregate returns made to shareholders throughout the life of the company. Sufficient operating capital has been left in the treasury to commence development on placer properties now held in the Yukon.

▶ During the third quarter of 1943, Granby Consolidated Mining, Smelting and Power Co., Ltd., Similkameen district, earned an operating profit of $93,472 after deducting reserves for income and all other taxes amounting to $16,775. After provision of $70,156 for depletion and depreciation, net income was $23,316. A dividend of 15c per share, U. S. cy., will be paid Dec. 1, 1943, to shareholders of record Nov. 15, subject to the approval of the Foreign Exchange Control Board. The company hopes to secure some measure of relief from the adverse labor-shortage situation during the winter months, when some seasonal labor may be made available.

YUKON TERRITORY

▶ Yukon Consolidated Gold Corp., Ltd., largest Canadian placer operator, was unable, as a result of the labor shortage, to take advantage of the best season in seven years as regards plentiful water conditions. From a normal payroll of 700, the company has operated throughout the past season with an average of only 175 men. Only five of the ten dredges were operated, and although recoveries have exceeded expectation, it has been necessary to curtail drastically the thawing and stripping developments necessary for future mining.

▶ St. Eugene Mining Corp., Ltd., in a recent meeting in Vancouver, approved an agreement with Frobisher Exploration Co. for the use of $105,000 in mine exploration and development in the Pacific Northwest. G. R. Burge, Toronto, president of the Frobisher company, has been elected president of St. Eugene.

▶ Mills for treating high grade strategic ores, much power development, and the transportation of concentrates by plane are among the developments predicted for

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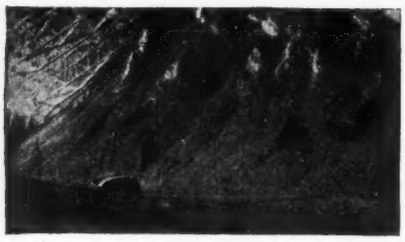

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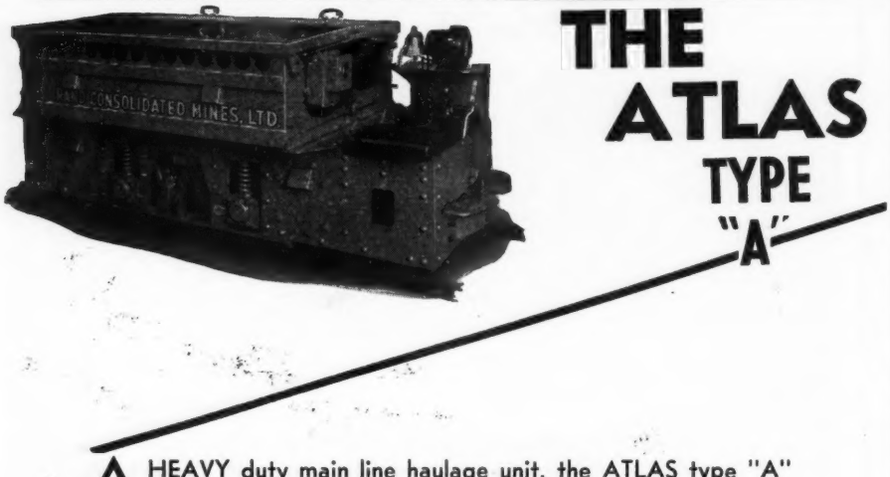

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Canada *(continued)*

Alaska and the Yukon by Frank E. Woodside as a result of the new oil pipe line connecting Norman Wells and Whitehorse. Woodside is manager of the British Columbia Chamber of Mines. Returning recently from a trip to the Yukon, he commented that many deals involving mining properties are now being concluded with the purpose of beginning operations after the war.

▶ To the end of 1942, mineral production in the Yukon has amounted to $237,106,886, according to a government report. Of this value, gold accounted for $208,264,695; silver, $20,952,479; and the remainder was made up by copper, coal, tungsten, and antimony.

MEXICO

General wage increase eases labor troubles—Bank of Mexico plans minting gold

▶ Mining in Mexico continued to be generally good as winter approached. Labor conditions are smooth on the whole, thanks to the 10 percent wage increase granted last spring and the presidential decree that went into effect on Oct. 1 making obligatory raises scaled from 50 percent down to 5 percent for all who earned up to 10 pesos ($2.10) a day, with the larger hikes favoring those in the lower wage brackets. While most mining companies have accepted this latter raise, some small companies are holding out against it. Their cases are before the federal Board of Conciliation and Arbitration and the mixed committee of employer, labor, and government representatives appointed by the Labor Ministry to supervise enforcement of the wage increase.

▶ Transportation, particularly rail, is still below par. Special efforts are being made by the National Railways, the Republic's largest railroad, to provide the mining industry with ample cars and locomotives to assure sustained haulage. The National Railways has had much trouble from landslides and washouts during the prolonged rainy season. The company hopes that 1944 will see much improvement in its service for mining.

▶ That the national miners union is eager to back up the recently enacted presidential decree outlawing unauthorized and unjustified strikes in industry for the duration was manifested by the complaint the union's secretary general, Juan Manuel Elizondo, made to the Labor Ministry that employees of the Cia. Minera El Doctor, S. A., an important silver producer in San Jeronimo municipality, Queretaro, had staged a short sit down strike as a protest against alleged violations of their work contract. The ministry is investigating the case.

▶ Section No. 12 of the national miners union, comprising employees of the Aquiles Serdan units, Chihuahua, of Amer-

ican Smelting and Refining Co., have organized a consumption cooperative society with the 60,000 pesos ($12,250) the company provided them for that purpose under a recent working agreement. This cooperative has been recognized by the Ministry of National Economy which has jurisdiction over all such societies in Mexico.

▶ Damage amounting to several thousand pesos to property and in lost working time was suffered by the San Rafael mining cooperative society, Pachuca, Hidalgo, when a cage jammed in the shaft of one of its mines. It required several days to extricate the cage, during which work was suspended in that part of the mine. The mishap was said to have been caused by the drunkenness of the operator of the cage. Nobody was injured in the accident.

▶ Dr. Kiso Turu, Japanese founder and operator of Turu Mining Co., with headquarters in Mexico City, that conducted La Azul mine, important fluorite producer near Taxco, Guerrero, was cleared by the federal Supreme Court of charges of fraud in connection with operation of the mine. The tribunal found that it was impossible for the Japanese to operate the mine, the basis of the fraud charge, as it has been taken over by the board of control and vigilance of enemy aliens' properties.

▶ Two Chihuahua mining companies, the Cias. Minera de Pinos Altos and Dolores, are having labor trouble. The national miners union accuses the former of laying off 75 employees on the ground that a motor broke down and there was no need for their services. The union charges that this is a pretext to dismiss the men. The federal Board of Arbitration ordered the company to reinstate these employees and pay them full wages during the time they were off. The union charges that Dolores suspended work without authorization or notice to its workers. The Board has called a conference of representatives of the company, the workers, and the union to settle this case.

▶ Mining is much concerned about another substantial pay rise that is in prospect. This is the demand of the Confederation of Mexican Labor, Mexico's strongest work organization, that minimum daily wages be raised to from 5 to 10 pesos, the highest in this country's history. The Confederation contends that this minimum daily pay is an imperative necessity because of soaring living costs in this country. This demanded hike would be for 1944 and 1945 and for the various labor zones of Mexico: 5.90 pesos for the Federal District; 5.00 to 5.50 for areas where living costs are lower than in the national capital; and 10 pesos in isolated Baja California. The minimum daily wage is fixed every two years in Mexico. Mixed committees of government, employer, and labor representatives are now working out the 1944-45 scales.

▶ Last summer, the Confederation petitioned President Manuel Avila Camacho to order a general 50 percent pay increase for all workers in Mexico. The obligatory hike of 50 down to 5 percent for those earning up to 10 pesos a day was apparently a compromise on that demand.

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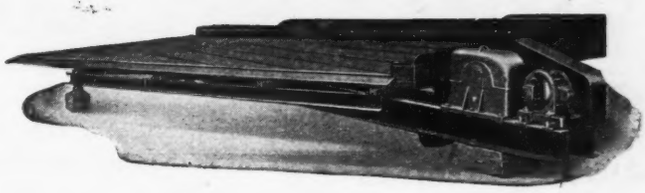

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▶ Mining is pleased, however, by the statement of Finance Minister Eduardo Suarez that no tax hike of a general nature is in store for the industry. The official intimated that as mining is Mexico's prime business, the government expects to obtain a greater tax yield from it, thanks to increased war producion and exports, rather than from additional taxation. It is understood that mining already provides about one-half of the government's revenues.

▶ Minting of gold coin, suspended since 1931 when Mexico went on the silver standard and Mexican yellow money was no longer legal tender, is to be resumed soon, it is reported. The Bank of Mexico is reported to be making plans for this minting, which is intended to curb speculation in Mexican gold money.

▶ The national miners union has circulated labor circles to advise job seekers to stay away from Cananea, Sonora, site of Cananea Consolidated Copper, as all mining jobs there are filled and no workers are wanted right now. The union said that disappointed job hunters have become a problem in this copper mining center.

▶ Zacatecas is advancing her program for the building and reconditioning of roads that serve mining regions. The state government expects that this work will be well advanced by the end of 1943.

▶ The Nuevo Leon state labor board has

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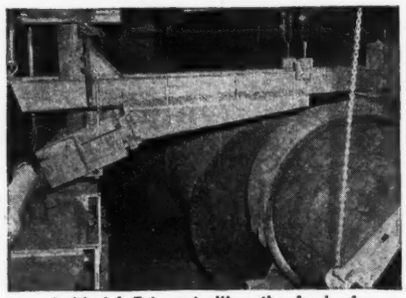

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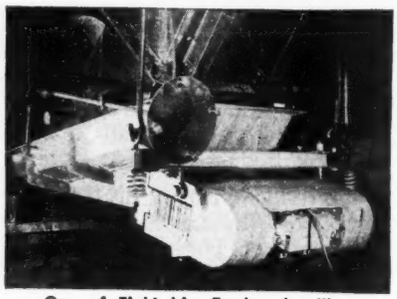

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Mexico *(continued)*

recommended the payment of heavy indemnification to the relatives of the seven miners who were killed by gas last year in El Diablo mine in Sabinas Hidalgo municipality. The recommendation has been submitted to the federal Board of Conciliation and Arbitration for action. The state board's ruling holds the company and the contractor for whom the men were working equally liable for the accident and the indemnification payment.

▶ The iron and steel mill that Altos Hornos de Mexico, S. A., chairman of the board of which is Gen. Abelardo L. Rodriguez, ex-President of Mexico, is establishing at Monclova, Coahuila, will be able to start the production of sheet iron in February, according to Louis Fink, an official of the company.

▶ Altos Hornos has undertaken to pave some streets in Monclova, expand the tap water service and build a grade school there. These works are to start late this year. The company recently made a working agreement with the national miners union and affiliated organizations that seems to assure it freedom from labor troubles.

ECUADOR

Two mines make up country's mining industry — Gold, silver, and copper are chief products

▶ With the exception of many small hand operated gold placers in various parts of the country, the Portovelo mines in the Zaruma district, operated by South American Development Co., and the Mercedes mine of Cotopaxi Exploration Co. at Macuchi are the only producing mines in the country. Some exploration development has been carried on during the last three years at the Pilzhun silver mine in the province of Canar by Senor Juan B. Semeria of Cuenca, but as yet no important amounts of ore have been found there.

PORTOVELO MINES

▶ These mines, operated by South American Development Co. since 1896, have for many years been a very important factor in the economy of Ecuador. Their principal product has been gold with some silver, and recently a small tonnage of lead has been produced. At present about 500 tons of ore are milled daily.

▶ During the past 18 months, the company has had from one to three men in the field investigating all reported prospects of strategic minerals in the country. In addition some investigations were made in other South American countries. At the present writing a region along the Eastern cordillera in Ecuador, east and southeast of Nabon in the province of Azuay, is being examined for a possible source of quartz crystals. Promising specimens were recently brought out from the area by a miner on vacation.

▶ For the past year resident company offi-

cials and engineers have been directing for the government the construction of the last unfinished link of the highway between the interior and Piedras, the end of the railroad leading up from the coastal port of Puerto Bolivar. This highway will eventually be a part of the International Panamerican Highway. It passes within two kilometers of the mining center of Portovelo. The section of road being worked is that traversing the steep jungled western slope, and its completion, which is expected before the end of the year, will mark the end of nearly fifty years of mule transportation experienced by the company.

▶ During the first part of the year, the company finished a quinine plant at Portovelo, and this has been in production for several months. There is an abundant supply of chinchona bark nearby on the jungled mountain slopes of the Zaruma basin. Legend has it that discovery of chinchona bark as an effective cure for malaria was first made by Indians a short distance south of Loja, the principal town of southern Ecuador. Portovelo is about 125 kilometers by highway from Loja.

MACUCHI COPPER

▶ This mine is located at about 6,000 ft. elevation on the jungled western slope of the Andes, about 100 kilometers west of the important interAndean town of Latacunga. The deposit was known and mined in a small way by the Spaniards about 200 years ago, but was abandoned and lost. In 1933 it was rediscovered, and in 1935 Cotopaxi Exploration Co. obtained an option and started exploration. Transportation proved a very difficult problem, and it took about three and a half years to bring the mine into production.

▶ From a beginning of shipping flotation concentrates of copper sulphides, the company has gradually improved its operations and shipping problems by first installing a sintering plant and later a smelter, with the result that the enterprise now constitutes a rather unique self-contained unit with a daily production of about 20 tons of blister copper. The ore being mined averages about 4 percent copper, 0.4 oz. gold per ton, and 2.5 oz. silver.

▶ Fuel oil is used to operate the smelter, and daily consumption is 6000 to 7000 gal. This is shipped up river from Guayaquil in steel bottomed launches and canoes for a distance of about 200 km., from where it is taken on to the mine by trucks a distance of 110 km. on a highway which the company constructed and maintains. Low water in the rivers during the greater part of the dry season (August through December) constitutes a serious problem in the transportation that has not yet been satisfactorily overcome.

▶ From the outset the company has maintained a rather intensive program of exploration in search of new ore. Diamond drilling, both underground and from the surface, and surface mapping along the mineralized zone have been the principal methods of exploration employed. Dense jungle growth and generally heavy overburden, combined with very rugged topography, have made geological mapping of the region a slow and difficult undertaking, and the wet season in such country contributes its share of hindrance to progress. South of Macuchi, along the general zone of mineralization, some promising alteration "bulbs" similar to the one accompanying the Mercedes orebody have been located, and prospects of finding new ore appear good.

▶ Recently the company has taken over for the government the direction of the construction of the highway up over the western range from Macuchi to Zumbahua. The elevation where the road is to pass over the divide is about 13,000 ft. From Zumbahua to Latacunga, a distance of about 70 km. a fair dirt road now exists. Some of the Company's road equipment is being employed on the job.

GENERAL

▶ Beginning Oct. 1, a new decree, passed by the present Congress, goes into effect increasing wages of industrial workers from 5 percent in the higher brackets to 50 percent in the lowest. This results in an average wage increase, both at Portovelo and Macuchi, of about 35 percent. Due to the marked increase in the cost of living that has taken place during the past year, the increased wages appeared a true necessity, but from the continued trend of prices, it appears doubtful that the wage earner will be the one to benefit from the decree.

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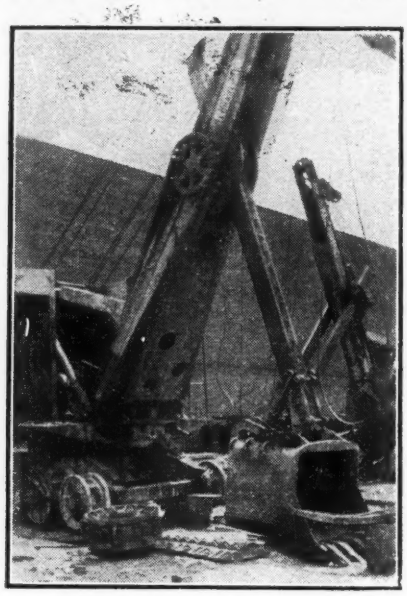

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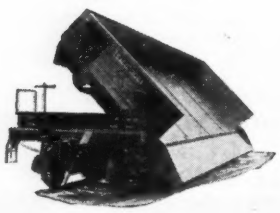

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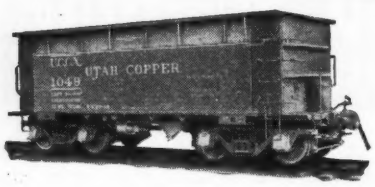

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PERU

Cerro de Pasco buys Magistral mine—Five gold companies form new unit in merger

▶ The Magistral mine, located in the northeastern part of the department of Ancash, has been purchased by Cerro de Pasco Copper Corp. from Mr. Mariano Tarnawiecki, for the sum of $50,000. Magistral is a large contact metamorphic deposit, apparently with high copper values. It was studied in 1929 by New Verde Mines Co., which turned it down because of adverse market conditions at that time. Several other groups have also done exploration work in the last few years. The mine has not been developed, except for a few unimportant workings. Cerro de Pasco plans to start diamond drilling in the near future.

▶ As reported previously, the flotation unit which operated at the Rescate mine near Arequipa, has been installed on the Santa River near the city of Huaraz in the department of Ancash. The plant is owned by Mauricio Hochschild, and is now treating ore from the Santa Elena mine, owned by his group. It is reported that the concentrator, which has a daily capacity of about 80 tons, will soon be enlarged to treat over 300 tons of ore a day.

▶ The merger of several gold producing mines, which has been in prospect since last year, finally came about last month with the official announcement that five important properties had fused to form a single entity, the Consorcio Minero Peruano. The Consorcio, which has a capital of 16 million soles, (about $2,500,000 U. S. Cy.), will include the following companies and properties: Compania Aurifera Nazca, Compania Aurifera Caraveli (Calpa mine only), Compania Aurifera Chala, Otoca, and Los Incas. All these properties are located near the coast. Nazca the largest producer of the group, has practically exhausted its reserves, and is now mainly dedicated to cyaniding its richer tailings. Caraveli, which owns two mines, Calpa and Huachocc, has gone in only with the former, which has been a gold producer for the last five years. Besides, Calpa has about 50,000 tons of gold-bearing high grade copper sulphides, and is at present installing a plant for bulk flotation followed by cyanidation of the concentrates. Chala has not as yet started operations; it has however large reserves of high grade gold-bearing oxides, which will be treated by cyanidation. Otoca, an old mine, extensively worked by the early Spaniards, has very large reserves of low grade gold ore, but is not as yet in operation. Los Incas, which is in the process of development, appears to be an excellent prospect. Its ore, rich in gold, contains high copper values, and will very likely be treated by flotation. The Consorcio acquired last year all the equipment from Compania Minera Nacional, which closed down. This equipment consists mainly of a 50-ton flotation unit, a 100-ton cyanide

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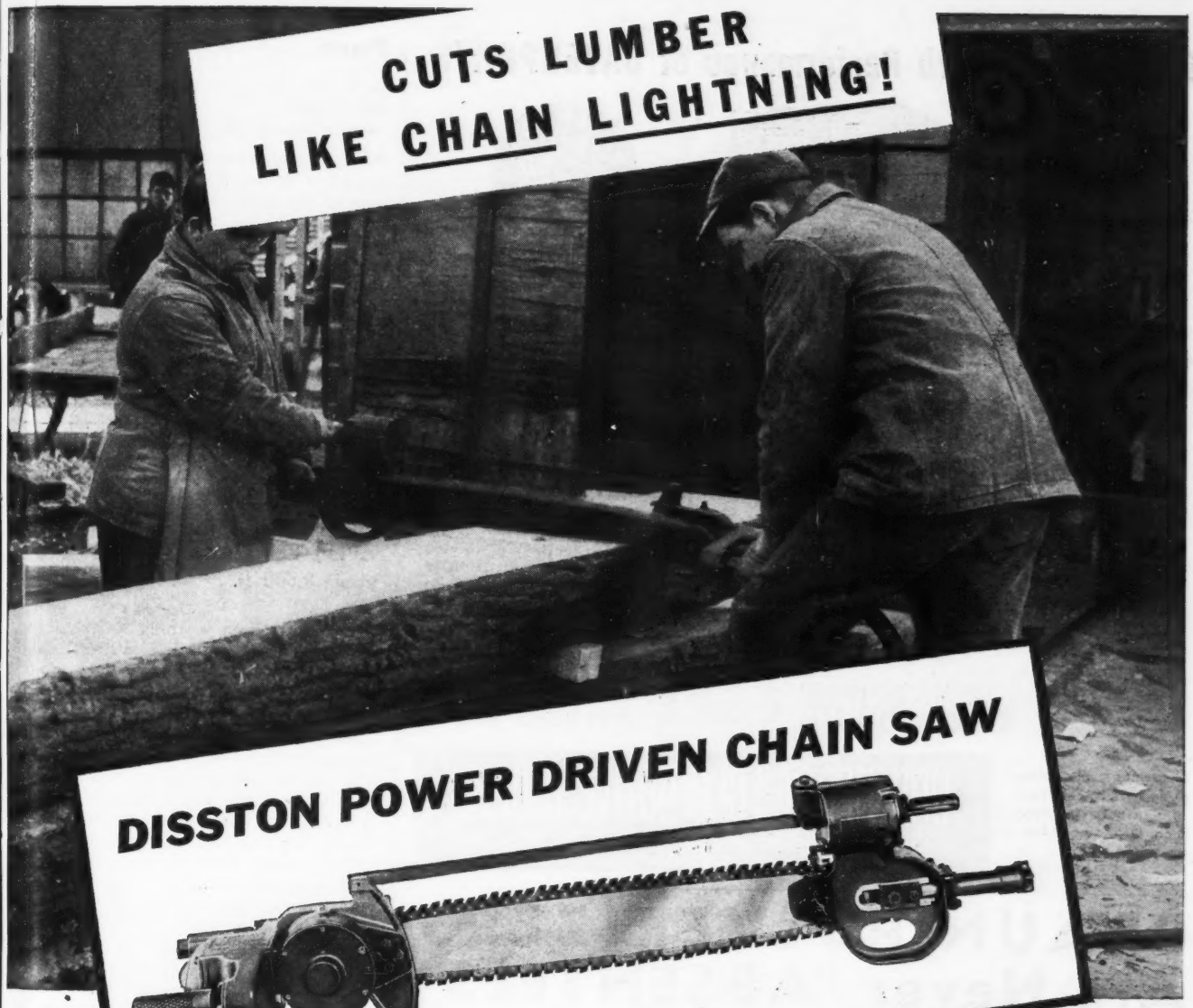

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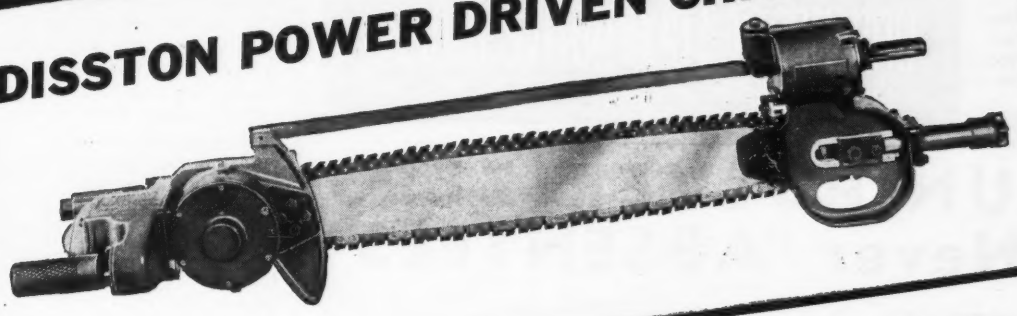

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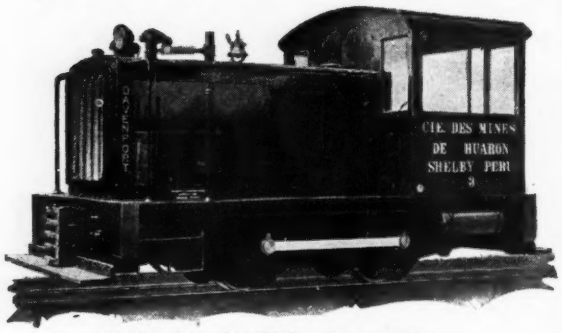

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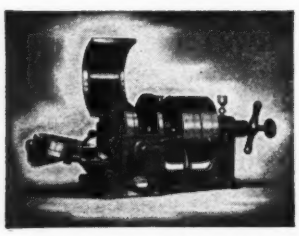

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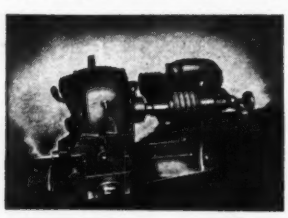

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Peru *(continued)*

plant, and three large Westinghouse hydro electric plants. This machinery will be distributed among the several mines.

▶ The Tarica mine, a small but rich lead and silver deposit, located in the northern part of the department of Ancash south of Magistral, has been recently acquired by Compania Aurifera Buldibuyo. Tarica has been exporting hand-sorted lead and silver ores for at least 15 years. The Buldibuyo outfit plans to install a small concentrator. During the last war, some tungsten was produced from small veins within the same property.

AFRICA

Interest in Orange Free State reviving—Plan mining to depths beyond 8,500 ft.

▶ There has been a strong revival of interest of late in the West Witwatersrand region, including the Orange Free State. It had been considered that the western and south-western areas possessed great possibilities. Now probabilities and even reasonable certainties are being considered. The changed attitude is due to exploration and development so far having made it apparent that values in the western country are more uniform and persistent than in the mines from which millions are being produced annually in the Witwatersrand proper. Where deep drilling has encountered a mineralized reef, that reef has disclosed values in nearly, or practically, every drillhole cutting it along great lengths of strike. Evidence that this is indicative of general western conditions, at least in the reefs so far cut, is supported by the fact that Blyvoor has continued to develop 100 percent of payability, and that Western Reefs, though working on a reef of the Witwatersrand proper series, has a very high percentage of payability and that its inch-pennyweights average is exceptionally high.

▶ The flotation is already proposed of Western Ultra Deep Levels, Ltd., to test the advisability of undertaking to mine the downward continuation of the Blyvooruitzicht Carbon Leader reef. Anglo American Corp. of South Africa has secured options for five years over farms immediately south of and adjoining Blyvooruitzicht and Drifontein and will turn these over to the proposed new company at cost. These options comprise some 28,000 claims and command about ten miles along the strike of the reef. Of the 4,000,000 shares of 10s each, the initial capital of the new company, 1,500,000 will be subscribed at par providing £750,000 of cash for drilling and other expenses. Though it is proposed that this money shall be subscribed by financing companies, government approval of the outlay must be obtained.

▶ Two questions have been raised. Can mining be done successfully at depths greater than 8,500 ft., that being the depth

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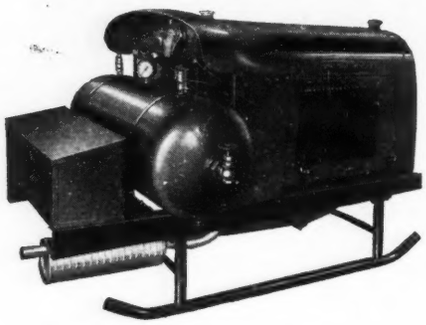

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Africa *(continued)*

at which it is calculated the Carbon Leader leaves the Blyvoor property? It has been estimated that operations at a depth of 13,000 ft. will become possible, and the Union Minister of Mines announced some time ago that a commission would be appointed to examine the matter. The other question is: if such deep mining is to be undertaken, why is not the Witwatersrand proper selected as the area for the experiment. This is answered by the statement that the areas available in the central Witwatersrand in which the Main Reef can be reached would call for operations at practically the same depths and reach portions of the reef below mines which are now working 3 dwt. to 5 dwt. ore. It is the phenomenal richness of the Carbon Leader in the Blyvoor property which prompts this undertaking.

▶ Working profits of the Witwatersrand gold mines came to £3,062,763 in September against £3,111,521 in August and £3,612,243 in September, 1942. Reports coming in at this writing indicate that the downward trend of earnings was slowed in October, as profits were not only higher than in September, but nearly up to the August total. Higher production costs, in part due to inadequate supplies and advanced prices for almost everything the mining companies are obliged to purchase, account for much of the decrease in profit.

▶ The directors of two companies, Rand Mines and Transvaal Consolidated Land and Exploration, are worried by the danger of control being purchased by nationals of enemy countries. They think considerable holdings have already been purchased by such foreigners and in consequence are taking steps to prevent the possibility of foreign control. Meetings will be held in January for the purpose of so altering the articles of both companies as to retain control in South African and British hands. The plan apparently is to deprive foreign holders of voting rights and of the privilege of serving as directors.

▶ To encourage the production of four strategic minerals in Southern Rhodesia; arsenic, tin, tungsten and mica, operations on such deposits have been exempted from excess profits taxation. It is recognized that profits, if any, would accrue only during the continuance of the war. In consequence it would be necessary to win back the necessary capital outlay quickly. Excess profits taxation would make this impossible, as allowance for capital return is lacking.

▶ The 4,000 natives employed at Messina Transvaal, a producing copper mine, went on strike recently. After 35 ringleaders had been arrested the men returned to work.

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Bourg from Three Lions

HEADFRAME and crushing plant of Nourse Mines, Ltd., one of the largest producers of gold in the central Rand area in South Africa

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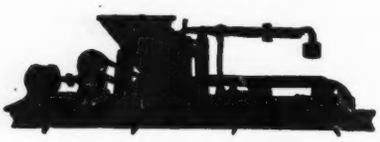
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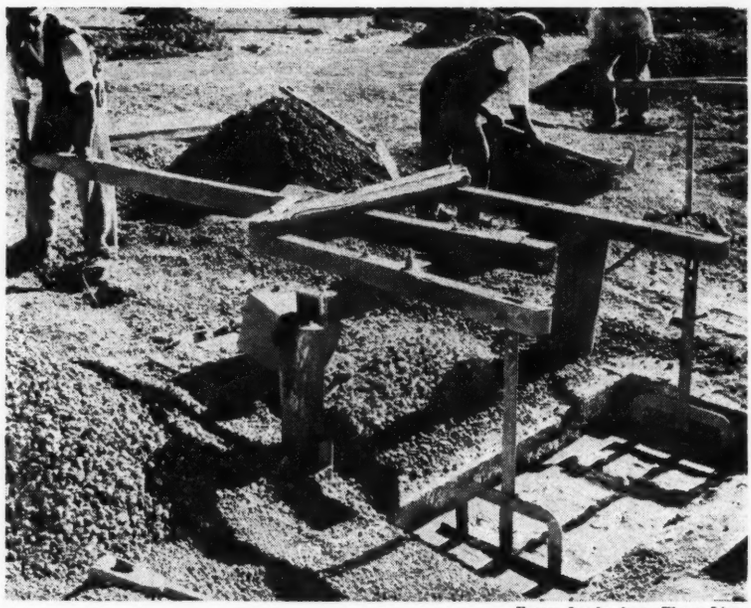


Fenno Jacobs from Three Lions

TIN CONCENTRATE is produced at the San Jose mine near Oruro, Bolivia, in this hand jig. Jig feed appears to have been carefully sized before treatment

AUSTRALIA

Golden Horseshoe is biggest tailings treatment plant—Norseman Gold produces pyrite

► Golden Horseshoe (New) Ltd., at Kalgoorlie, is the big tailings re-treatment company of the West. It was formed in 1929 to re-treat accumulated tailings of the old Golden Horseshoe mine; later on agreements were entered into with the Lake View and Star and Great Boulder Proprietary Companies to work tailings dumps on the leases of those companies. Regrinding of the tailings is not practised. The dump material is broken down with hydraulic nozzles, using cyanide solution, and pumped to the central treatment plant where the pulp is agitated and filtered on six Oliver filters, the gold being precipitated in a Merrill-Crowe plant. Tailings are then pumped to the residue dump.

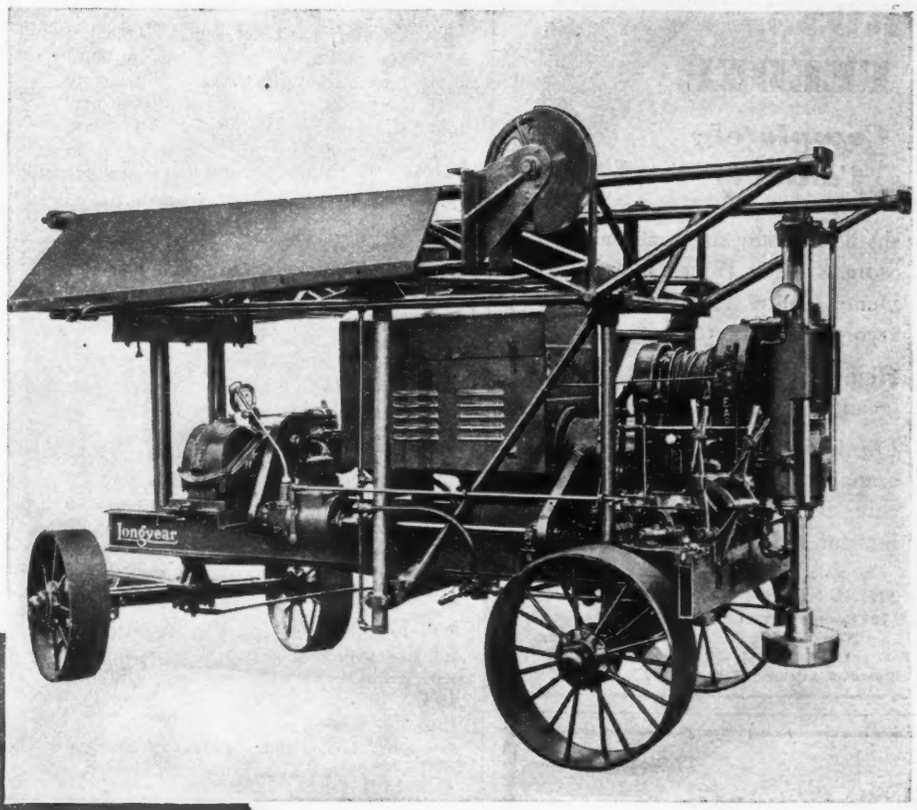
Operations have been very successful throughout, but conditions during the past eighteen months have affected operating conditions and profits. In the year ended Dec. 31, 1942, the company treated 486,170 short tons of material from the Great Boulder Proprietary Co. No. 2 dump for a joint working profit of £Stg. 42,732, of which Golden Horseshoe's half share amounted to £Stg. 21,366. The total return from treatment was 5s. 4d. (Aust.) per ton cyanided and all-in working costs were 3s. 1½d. (Aust.) per ton, leaving a working profit on joint account of 2s. 2½d. (Aust.) per ton.

The future of the company's operations is difficult to forecast. Tailings remaining for treatment in the Great Boulder No. 2 dump, based on the original estimate, amount to 427,412 short tons, and at the present rate of through-put will last until March, 1944. There is an understanding with another company by which about 500,000 tons of tailings, may be treated on a 50-50 basis as regards to profits, but whether treatment will be profitable or practicable cannot be stated at the present, for difficulties of rising costs, manpower, equipment, and stores have increased greatly in the past year and these factors will be decisive.

► Triton Gold Mines N. L., at Reedy, 35 miles northeast of Cue, is among those mines which have been forced to close down through difficulty in securing and keeping labor under existing conditions. In the financial year which ended on March 31, 1943, operations were severely reduced and work was suspended on July 31, 1942. While there was an operating profit, after writing off development redemption, the expense of preparing the mine and plant for closing down converted this into a net loss of £A3,954.

Since the commencement of operations in 1935, the total profit has amounted to £A518,062, out of which 11 dividends, amounting to £A264,000, have been paid and £A102,757 has been appropriated for capital expenditure. In the portion of the year during which active work was in progress, 20,636 long tons of Triton mine ore was treated for the recovery of 6,885 fine oz. of gold, equivalent to 6.67 dwt. per ton. In addition, 646 tons of old tailings returned 45 oz. of gold, or 1.41 dwt. per ton, and 1,036 tons of ore was purchased from prospectors. Ore reserves were estimated at 226,000 tons, having an average assay value of 6.4 dwt. gold per ton. No new ore was developed as development work had practically ceased by the end of the previous period. The head value of ore to the mill was 7.19 dwt. per ton and residues averaged 0.52 dwt., the recovery being 91.8 percent.

DRILLING *Down 1750 feet* WITH 20 SKF BEARINGS



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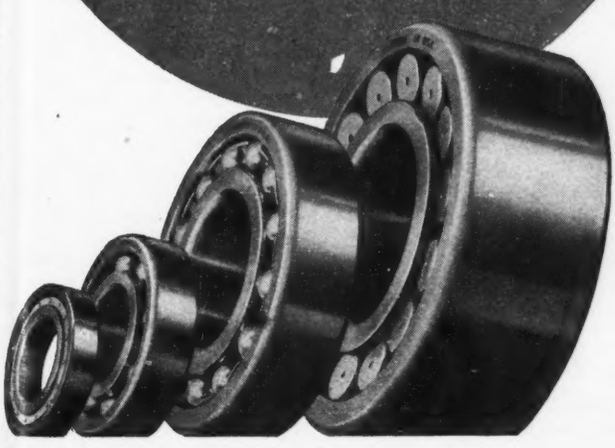
BEARINGS



An ideal hookup for wartime exploration work requiring rapid, easy moving by means of a truck or a tractor is this trailer-mounted U. G. Straitline Diamond Core Drill with its 26′ folding mast for 20′ rod pulls. High in capacity, 20 SKF Bearings insure long life and smooth operation. SKF's never need adjustments... require only a minimum of lubrication. By keeping important moving parts in good working order, they do their part in helping this drill do its part in unearthing vital raw materials. 5426

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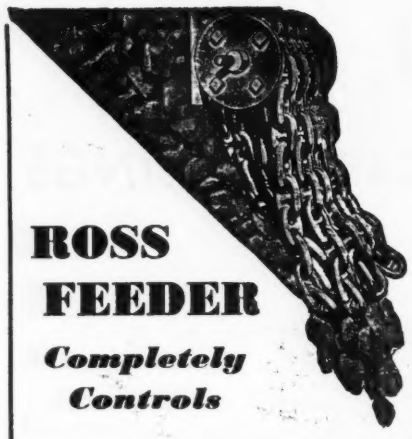

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Australia (*continued*)

Mining conditions have always been difficult owing to the width of the orebody, weak walls, and the presence of heavy water in beds westward of the hanging wall. Some parts of the workings had to be square set timbered with timber brought in from 400 miles away. Country rock was used as filling but deslimed mill tailings were found to be superior, and the last report states that general underground mining conditions were steadily improving with the gradual introduction on the new filling throughout the mine. There are still several objectives to be prospected, in any one of which an important orebody might be located. Costs for the period were as follows: mining (excluding development), 44.35s. per ton; milling, 11.86s. per ton; and total, 56.21s. per ton.

While stoping conditions improved and mining became less costly, the favorable circumstances were more than offset by lower output and other difficulties while closing down the mine, so that mining costs increased by 1.28s. and milling by 0.95s. compared with the previous year. The underground workings are being kept unwatered to prevent collapse, and maintenance work is being carried out, a large part of the expenditure being met by the government. The lode is in a belt of greenstone schist four miles wide, with granite on both sides.

► Gold production for Western Australia for July was 46,360 fine oz., as compared with 40,091 fine oz. in June. In July, 1942, the output was 83,402 oz., and in the same month of 1941, 84,680 oz. Production for the seven months of the year, to July 31, is 320,227 fine oz., compared with 512,171 fine oz. in the same period of 1942, and 583,729 fine oz. in the corresponding months of 1941.

► Pyrite for sulphuric acid manufacture is being produced by Norseman Gold Mines, N. L. at Norseman, 160 miles south of Kalgoorlie, and is shipped by rail to Perth, a distance of 510 miles. The pyrite is mined on the Iron King lease, adjacent to the Norseman mine, in a deposit previously worked by open cut, producing ore assaying under 3 dwt. gold per ton. Need for sulphur directed attention to neighboring lodes with a high pyrite content and containing very low gold values.

The ore is being mined by underground stoping methods, the lode being 15 ft. to 20 ft. wide, and costs are low. Considerable preparatory work has been necessary, including a new main shaft, which is being constructed by stripping and enlarging to three compartments an old, disused shaft, which is being sunk to lower levels.

A flotation plant is being installed in the company's treatment plant for the concentration of the pyrite. In the past month 303 tons of mineral was consigned to Perth, and on completion of the underground preparatory work and the construction of the flotation unit, the output will be considerably improved.

New South Wales

► The report of the Broken Hill Proprietary Co. Ltd. for the year ended May 31, 1943, shows a net profit from trading of £A559,880 which, with £A137,911 income from investments, brings the total net profit for the year to £A697,791. The profit is arrived at after providing £A968,984 for depreciation, £A855,000 for income tax for the year and £A509,098 for special depreciation on plant, machinery, and equipment rendered necessary by wartime activities and conditions. Two dividends, amounting to £A694,251 were paid during the period.

There has been a heavy demand for the company's products for both war and civil purposes. Existing conditions have caused many difficulties in operation, particularly in regard to the transport of raw material, the greater part of the iron ore having to be brought from South Australia and limestone flux from the quarries at Devonport, Tasmania.

Iron Mining Resumed

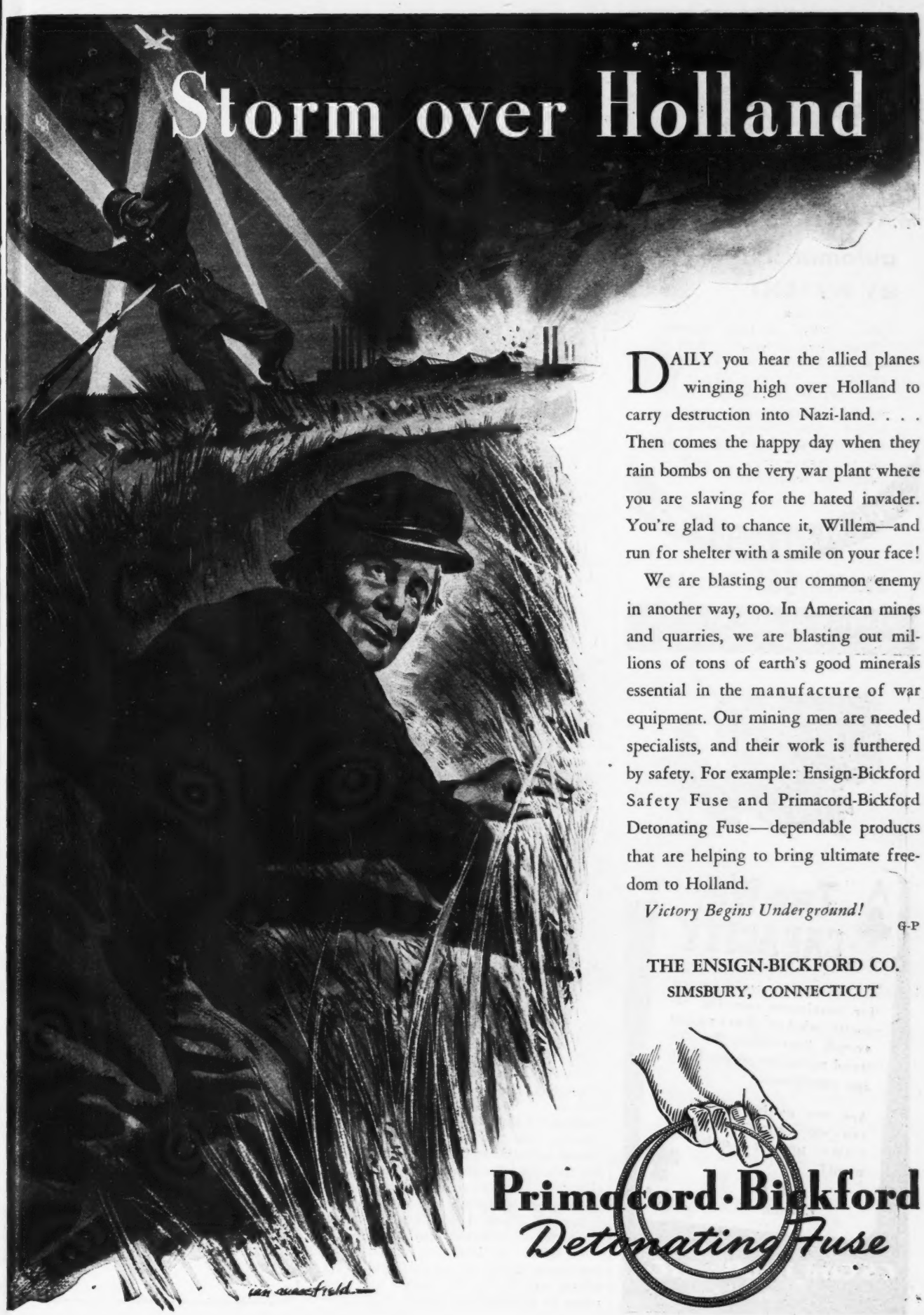
To meet transport difficulties and assist the iron-stone reserve, the mining of iron ore from New South Wales deposits has been resumed, although uneconomical. This ore is lower grade than that supplied from the company's South Australian deposits. South Australian ore is shipped direct to the works at Newcastle and at Port Kembla. There has been a heavy demand for alloys, and this, in conjunction with the use of lower grade ore and difficulties and delays in carrying out repairs to plant, has somewhat reduced tonnage of ingots. Withdrawal of men from the industry for service in the armed forces or for other industries has had a detrimental effect on operations.

The ferro-alloys plant at Newcastle has been developed and is meeting a wide variety of requirements, and the magnesium plant is meeting all demands for this metal. The latest addition to these subsidiary metal-producing plants is that for the manufacture of tungsten carbide, and a wide range of tool tips and wire drawing dies is being produced and used throughout Australia, the price being below the pre-war price for the similar imported article. A coal washing plant is to be erected at the Newcastle works and also a sintering plant to render accumulated flue dust available for blast furnace feed.

New Development at Whyalla

At the Whyalla centre, in South Australia, a new bench has been developed at the Iron Monarch mine, to which all mining and crushing equipment has been transferred from the bench just depleted. The Whyalla blast furnace is producing foundry iron, thus permitting a greater output of basic iron at Newcastle. Ferro manganese is also being produced by this furnace.

Shipbuilding is being continued at the maximum rate possible with the labor available. To supply adequate water to the town and works at Whyalla, a pipe line, some 260 miles in length, is being constructed from the Murray River, and it is expected that water from this source will be available early in the coming year. Limestone for the Whyalla furnace is being supplied from the new quarry at Rapid Bay, on St. Vincent Gulf, south of Adelaide, and it is intended to supply part



DAILY you hear the allied planes winging high over Holland to carry destruction into Nazi-land. . . . Then comes the happy day when they rain bombs on the very war plant where you are slaving for the hated invader. You're glad to chance it, Willem—and run for shelter with a smile on your face!

We are blasting our common enemy in another way, too. In American mines and quarries, we are blasting out millions of tons of earth's good minerals essential in the manufacture of war equipment. Our mining men are needed specialists, and their work is furthered by safety. For example: Ensign-Bickford Safety Fuse and Primacord-Bickford Detonating Fuse—dependable products that are helping to bring ultimate freedom to Holland.

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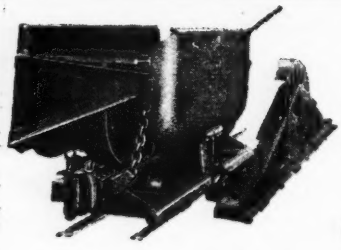

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Denver, Colorado

Australia *(continued)*

of the Newcastle requirements as soon as shipping is available. A maximum quantity of steel products is being produced at the Port Kembla works of Australian Iron and Steel Ltd.

Other enterprises in which the company is directly associated include: Rylands Bros. (Aust.) Pty., Ltd., which is producing wire and special munition work, and Commonwealth Steel Co., Ltd., which is turning out stainless and a wide range of special alloy and tool steel. The plant of the Australian Wire Rope Works has developed into one of the largest of its kind in the British Empire.

U.S.B.M. Finds More Alabama Bauxite

As a result of the expanded program of the Bureau of Mines and the Geological Survey, 33 small bauxite deposits have been found in the Eufaula district of Henry and Barbour Counties in Alabama, according to a recent announcement of the Department of the Interior. Eight of these deposits are now being worked by five private companies.

The eight deposits now in production contained a total of about 179,000 tons of marketable-grade bauxite, a small fraction of domestic production. About 40,300 tons of this had been mined and shipped at the time the announcement was made. Overburden has been stripped from an additional 104,000 tons, leaving 34.700 tons in reserve.

Estimates of the Bureau and the Survey place the total amount of bauxite material in the 33 new deposits at 1,680,000 tons, of which 352,800 tons is of commercial grade. Most of this bauxite occurs in numerous small deposits found under a shallow overburden which must be removed before mining is begun. In drilling these deposits Bureau engineers used auger-type drills which reduced costs to about 40c per ft. for the 100,000 ft. of holes drilled. Immediate commercial utilization of the ore, it is said, will return more to the government in new taxes than was spent in developing them.

Correction

Several errors appeared in Part II of Mr. Kroll's article, "German Metallurgy in Wartime," published in our October number. Page 82, column 3, line 9, for "oxides of lead and antimony," read "oxides of lead and tin containing little antimony." Page 83, column 3, line 1, for "sulphate," read "sulphide." In the same column, line 13, for "resistance," read "reaction;" also under the heading "Zinc," the thought intended to be conveyed was that "as a consequence of temporary overheating of the cables, the metal became brittle." On page 104, column 3, line 1, the expression should read "where they serve mainly as die-casting materials, are used more widely in Germany, etc." The editors regret the occurrence of these errors in handling Mr. Kroll's manuscript.

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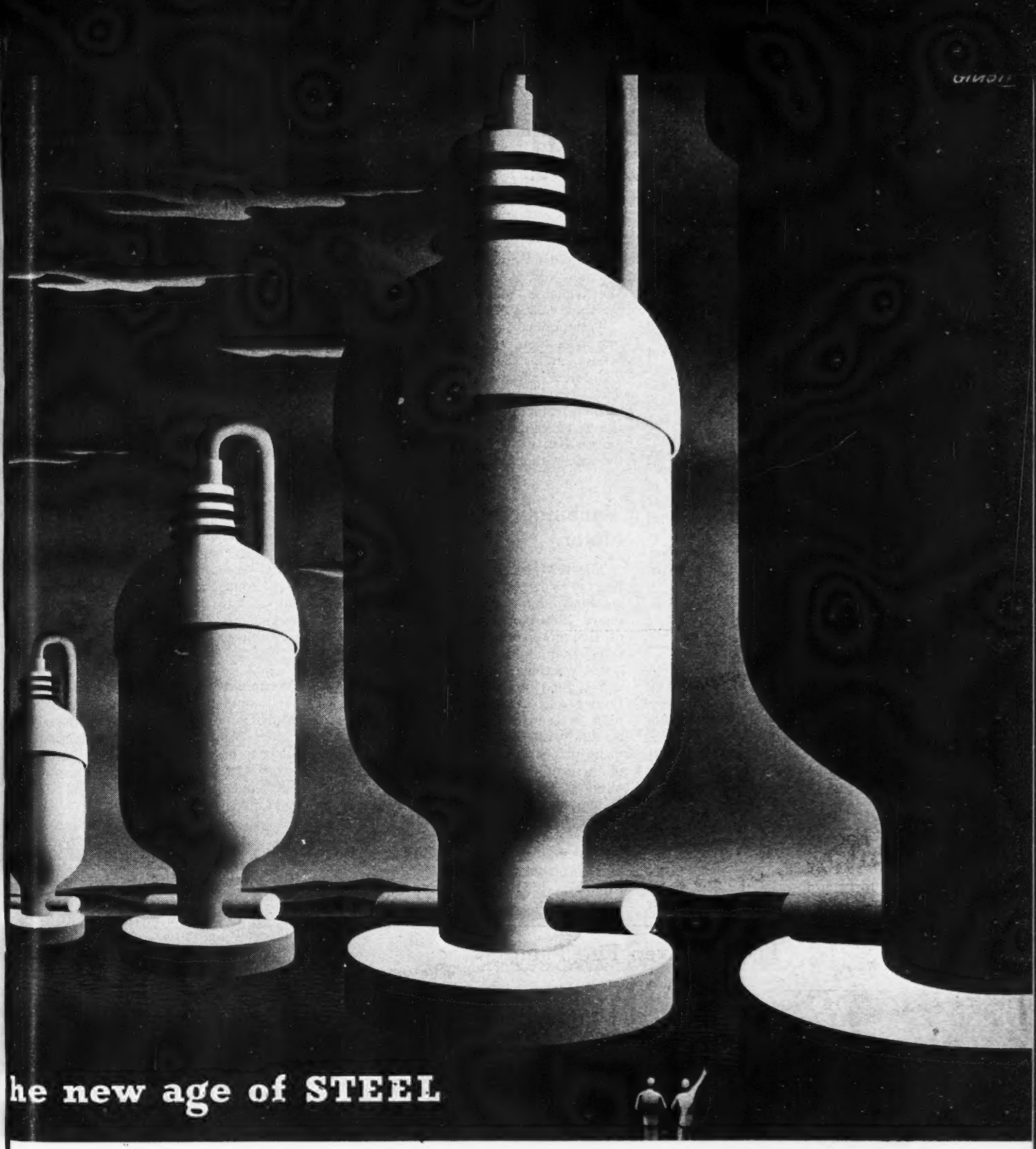

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EQUIPMENT NEWS

Ammonia Print Users Wanted for Test

Frederick Post Co., Box 803, Chicago, 90, Ill., wants 100 users of transparent ammonia-developed prints to confirm or disprove the laboratory and preliminary field tests of what is said to be an improved version of this process. Trial quantities of Post's new ammonia process materials will be furnished without charge to the first 100 firms applying for them, providing these companies agree to make to the Post company a detailed report of their experience with the new method. If the reports are favorable, the original production facilities will be available to the companies participating in the test. Further details may be obtained from the company.

Laboratory Test Magnet

A horseshoe-shaped Alnico magnet measuring 2½ in. high and 3 in. wide, with pole bases measuring ¾ by ¾ in. is now available from Dings Magnetic Separator Co., 509 E. Smith St., Milwaukee, 7, Wis. The magnet, said to be particularly suitable for prospectors and for laboratory workers, weighs 14½ oz.

Mine Locomotive Bearings

Ease of accessibility and maintenance are said to be features of the new design of journal boxes and bearings recently worked out for mine locomotives by Westinghouse and Whitcomb engineers. New Westinghouse mining locomotives now use these new journal boxes and bearings.

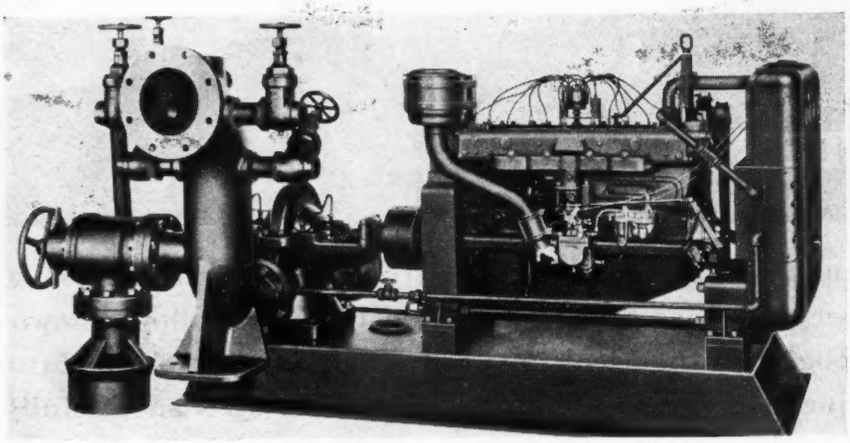
Anti-friction bearings of the double-row roller type, lubricated through grease fittings, are installed in journal boxes fitted with steel labyrinths designed to keep out dirt and keep lubricant in. Renewable wearing plates are provided, bearing adjustments are easily made, and the complete journal box may easily be removed from the axle without dropping the truck.

"Inching" an Electric Motor

The E-M Incher is a method of spotting or slowly rotating a 3-phase synchronous motor or a slip-ring induction motor. Slow-motion, high torque rotation of the motor is provided electrically by using commutated direct current to supply a slowly revolving 3-phase inching current.

Suggested uses for the Incher are positioning rolls in steel mills, spotting tube mills in cement plants, and for spotting or slowly rotating ball mills in ore treatment plants. Nudging the motor of one of these units with the starting switch is injurious to the equipment and to the switch, and other mechanical means are cumbersome and slow. The E-M Incher is said by the manufacturer to do the job quickly and effectively. Full information may be obtained from Electric Machinery Mfg. Co., 1331 Tyler St., N. E., Minneapolis, Minn.

Engine-Driven Fire Pump



Designed as an auxiliary unit for use in case of power failure of the regular installation, this Fairbanks-Morse fire pump is driven by a gasoline engine which is said to provide quick and reliable starting and operation in an emergency. The manufacturer also lists as features of the unit the fact that full engine horsepower is rapidly available after starting, the possibility of arranging for automatic operation, the economical cost of operation compared with larger marine-type engine-driven units. The pumps are supplied in capacities of 500, 750, and 1,000 g.p.m. A bulletin giving full details on these new pumps can be obtained from Fairbanks-Morse & Co., 600 S. Michigan Ave., Chicago, 5, Ill.

INDUSTRIAL NOTES

Renewal of the **Army-Navy "E"** award for excellence in the production of war materials was given to the following companies: **Traylor Engineering & Mfg. Co.**, Allentown, Pa.; **Independent Pneumatic Tool Co.**, Chicago, Ill.; **Whiting Corp.**, Harvey, Ill.; and **Storage Battery Division of Philco Corp.**, Trenton, N. J. "E" awards were renewed for the second time at **Electric Storage Battery Co.**, Philadelphia, Pa., and **Nordberg Mfg. Co.**, Milwaukee, Wis.

Herman Yaras, formerly president of **Marsman Trading Corp.** in the Philippines, has organized his own export-import business in Los Angeles, Calif. Trade arrangements for Latin-American countries have been made with the firm, Mexargo, in Mexico, D. F., as the result of a business trip by Mr. Yaras to that city.

Western Machinery Co., San Francisco, Calif., announces the appointment of **Arthur Halliwell** as production manager for the Wemco Sacramento plant. Mr. Halliwell has been vocational director for the State of Colorado and was formerly superintendent of General Iron Works, Denver, Colo.

BULLETINS

Aids to Engineers. Alexander Hamilton Institute has expanded its list of free booklets to include: "How to Prepare an Engineering Report," "Methods for Waste Reduction," and "Controlling the Cost of Maintenance Work." Any one of these reports is available by writing to Alexander Hamilton Institute, Dept. A-20, 71 West 23rd St., New York, 10, N. Y.

Pipe Couplings. A guide to the use of Victaulic flexible pipe couplings in various industries, including mining, and engineering data on these units has been prepared by Victaulic Co. of America, New York, N. Y.

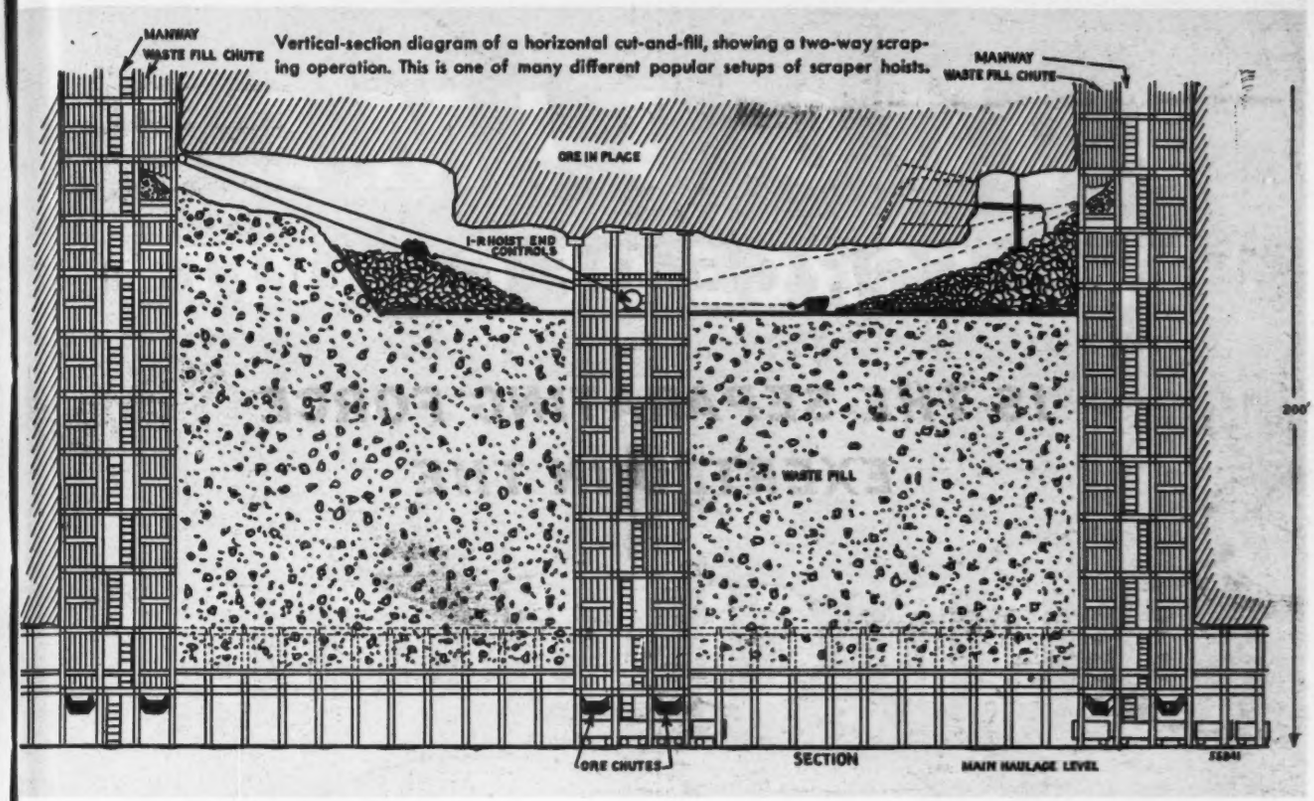
Tube Mills. Hardinge Co., York, Pa., has released two new bulletins. One, No. 18-A, describes the company's tube mills; and the other, No. 35-B, describes sanitation equipment made by the company.

Variable Speed Control. A new 128-page general catalog on variable speed control units has just been issued by Reeves Pulley Co., Columbus, Ind. The company believes this to be the most comprehensive book on variable speed control ever published.

Pipe Bending. A new technical book on the bending of copper and brass tube and pipe has been published for free distribution by Copper & Brass Research Corp., New York, N. Y.

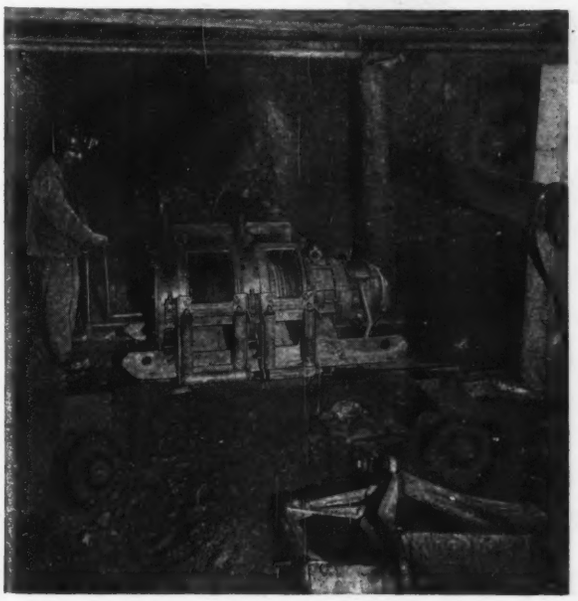
Ultra-Violet Lamps. Mineralight lamps for prospecting for and sorting fluorescent minerals are described in a new bulletin of Ultra-Violet Products, Inc., Los Angeles, Calif.

Masonry Saws. Clipper Mfg. Co., St. Louis, Mo., has published a number of bulletins in English and Spanish illustrating and describing Clipper masonry saws. Of special interest to the mining industry is the use of these saws in cutting and shaping all types of fire brick for furnace lining and similar uses.



Vertical-section diagram of a horizontal cut-and-fill, showing a two-way scraping operation. This is one of many different popular setups of scraper hoists.

SCRAPERS MULTIPLY MANPOWER



A 50-hp Ingersoll-Rand Electric "Tugger" Hoist equipped with end controls for two-way scraping on a heavy-tonnage transfer installation.

To meet unprecedented tonnage demands, many mines are adding slusher-hoist equipment—because scraper mucking means:

1. **Relief of labor shortage**—New men can quickly learn to use scrapers and can thereby release older heads to perform the more exacting operations.
2. **Less development work**—The use of scrapers permits an ore body to be developed and put into production with fewer men.
3. **More tonnage mined**—Scraping speeds up mining. Frequently, loading and tramming are combined in one operation.
4. **Conservation of critical supplies**—Areas are worked faster. This results in direct savings of time, labor, timber, rails, and other supplies.
5. **Greater safety**—Stoping hazards are reduced to a minimum. The mucker is a safe distance from many of the sources of possible danger.

Realizing the increased interest in labor-saving methods under wartime conditions, we have obtained a supply of booklet TP-1603, "Multiplying Manpower with Scrapers." This is a condensation of a paper presented before the February meeting of A.I.M.E. The booklet describes and illustrates the application of slusher hoists to various methods of mining, such as timbered cut-and-fill stoping, untimbered cut-and-fill stoping, underhand stoping, block caving, top-slicing, sub-level caving, shrinkage, square set and stull timbered stoping, etc.

A study of this booklet will show how the scraper hoist can multiply manpower and help maintain high tonnages. Send today for copies for your organization.

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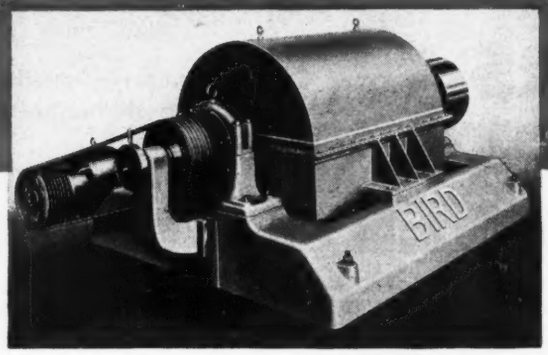

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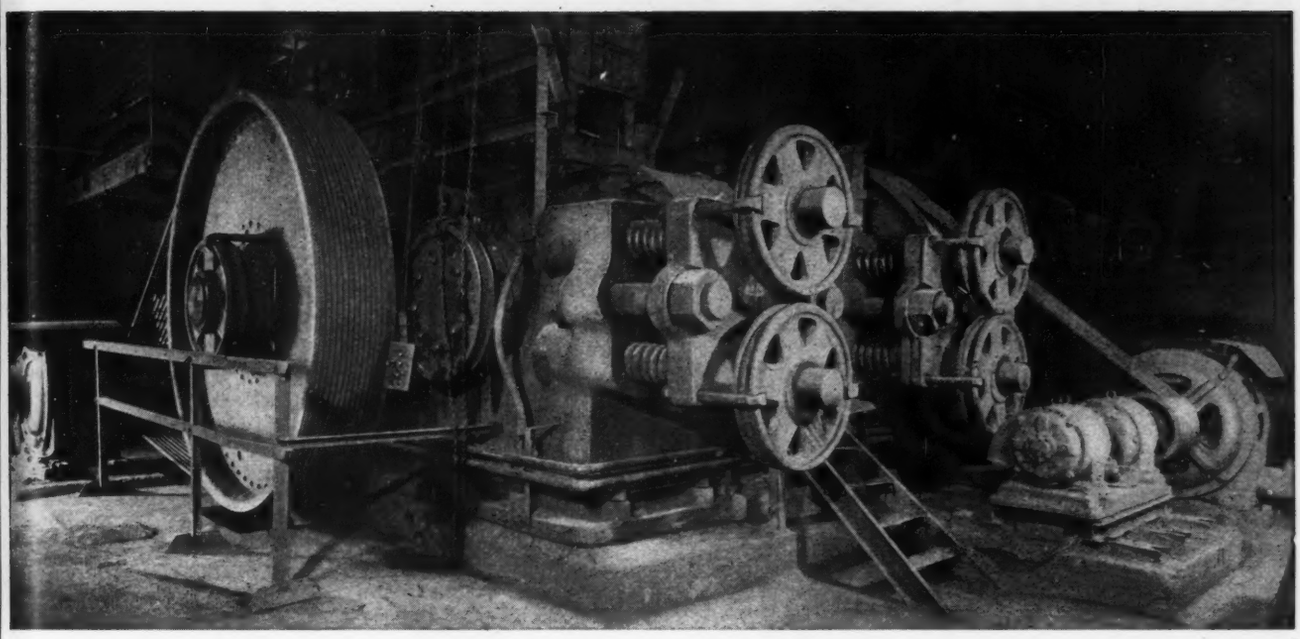

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The photograph above shows the installation of a set of 78" dia. x 20" Traylor Four Tension Rod Crushing Rolls that is doing a big job at the plant of a great copper mining company. Four Tension Rod Rolls are popular where enormous tonnages are needed, and this is particularly true in cases where low grade ore is handled. Many of the world's greatest operators in gold, nickel, copper and iron use and approve these machines.

Traylor Four Tension Rod Crushing Rolls possess the following characteristics—

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2. Positive and easy-to-operate ADJUSTMENT devices.
3. CAPACITY practically limited only by the proper selection of feed and the amount of power used.
4. Minimum unit cost of maintenance.

Traylor Four Tension Rod Crushing Rolls are designed to do the greatest possible amount of work, in the shortest possible time, at the lowest possible cost. Nothing less would answer, and it is because they fill these requirements in a masterful way, that these machines are so widely preferred.

• see *Bulletin 3627*

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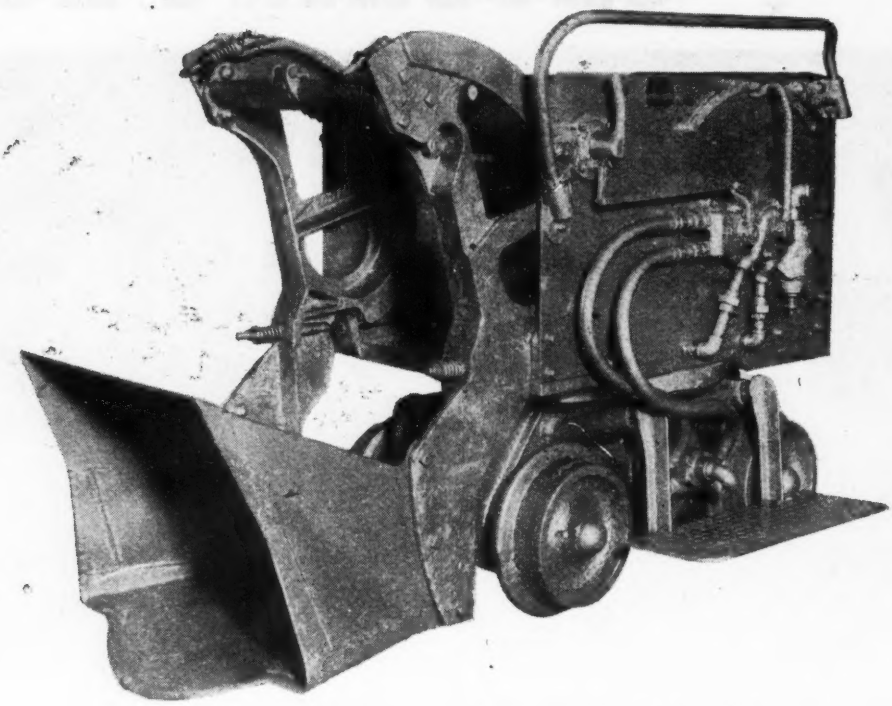
Export Department — 104 Pearl St., New York City. Foreign Sales Agencies: London, Lima, Rio de Janiero, Buenos Aires, Santiago, Antofagasta, Oruro, Montevideo.

OVER 10 YEARS AGO THE NOW FAMOUS

Eimco "Rocker-Arm" Loading Machine

WAS PATENTED



Since its conception many improvements have been added to insure supremacy in underground loading. To date no substitute has been developed that can match the simple, efficient action and rugged construction of the Eimco Loader as proved by this

FACT

Eimco Loaders have won every competitive test in every mining district in the world.

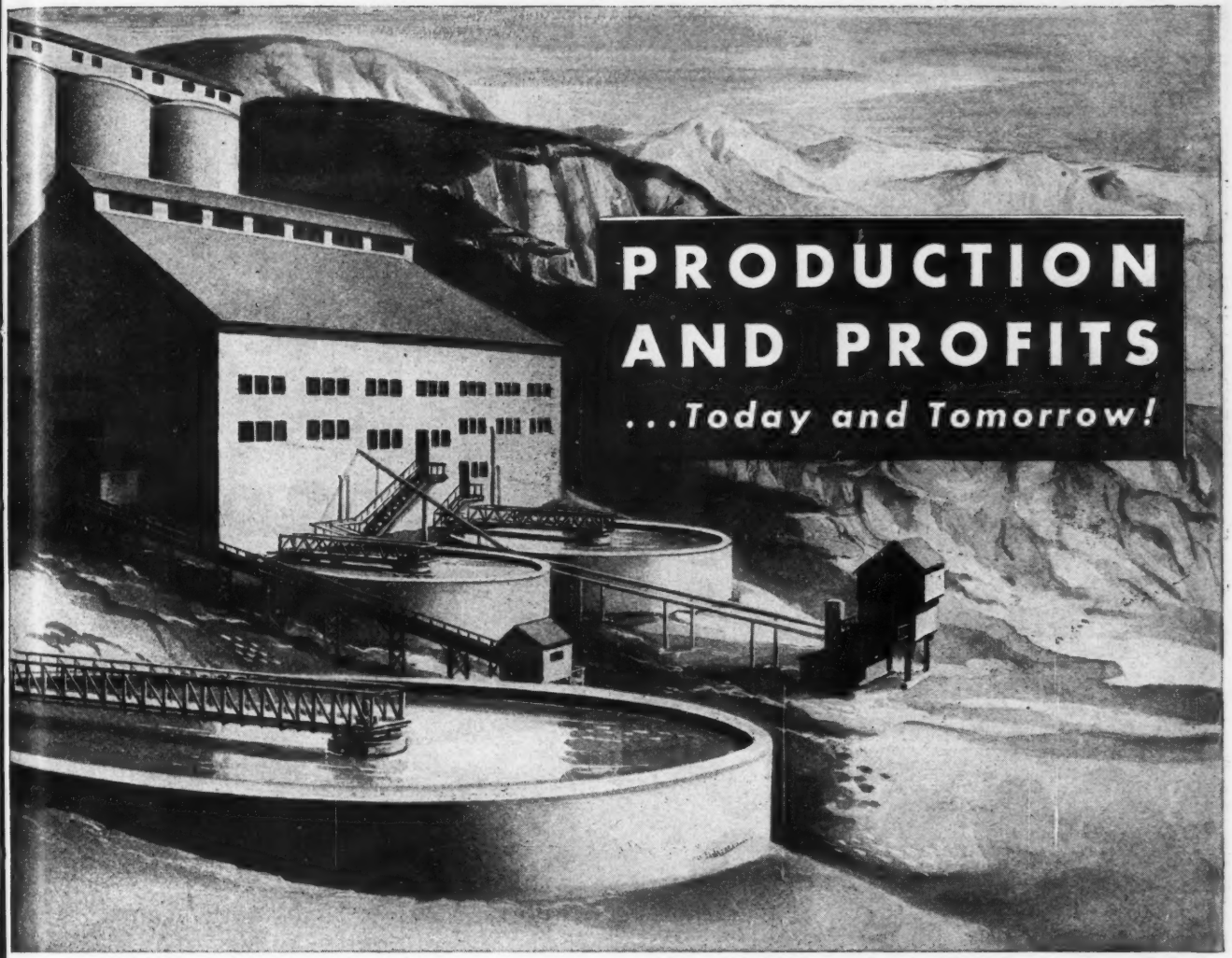
Don't take our word for it --- Investigate.

Why not buy the Champion!

The inherent superiority of Eimco Loaders has been so thoroughly proved that every machine sold carries a positive money-back guarantee that it will outlast and OUT-PERFORM any other mucking machine of comparable size and type at any air pressure, and under any working condition.

EIMCO

THE EIMCO CORPORATION, SALT LAKE CITY 8, UTAH
NEW YORK, 120 BROADWAY — SACRAMENTO, 1217 7TH ST.
CHICAGO, 111 W. WASHINGTON ST. — EL PASO, MILLS BUILDING



IN a metal-hungry world at war, tonnage is the all-important consideration . . . and rightly so. But tomorrow, in a world at peace, competition again will put a premium upon high recovery at low cost.

To meet war's demands, our mining and metallurgical industries are producing tremendous tonnages of copper, aluminum, magnesium, iron, nickel, zinc, lead and other "strategic metals." And one of the most important of DORR war efforts has been to supply modern methods and equipment used for essential steps in wet processing these ores. From the use of these modern methods has come the ability to handle increasingly lower-grade ores with ever-increasing efficiency.

Yes, tonnage, rather than economy is the important factor now. But, tomorrow's problem will be to treat large tonnages of "marginal ores" *and to make them pay.*

Our 30 years' experience in wet metallurgy is available to help in modernizing your plant, or for the development of a new project from research and testing through the design of plant and the furnishing of equipment. We shall be glad to send information on any phase of wet processing in the Metallurgical, Industrial, Chemical or Sanitary fields.

DORR

RESEARCH ... ENGINEERING ... EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

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THE DORR COMPANY, ENGINEERS

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SUGAR PROCESSING

PETREE & DORR ENGINEERS, INC.
570 LEXINGTON AVE., NEW YORK

WE HAVE it if they ask for it . . . canned in special 1-ton containers by the Chemical Warfare Service of the Army Service Forces.

Compressors are as necessary in the handling of war gas as in the operation of rock drills and other air-driven industrial equipment. Whatever the service, Texaco keeps compressors on the job, performing at maximum efficiency.

Texaco Alcaid, Algol and *Ursa Oils* assure wide-opening, tight-closing valves, free piston rings, open ports, clean air lines, maximum service life between overhauls, fewer repairs and replacements.

A Texaco Lubrication Engineer is freely at your service through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT — CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PR

THEY PREFER TEXACO

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

TEXACO

TEXACO

LUBRICANTS AND FUELS

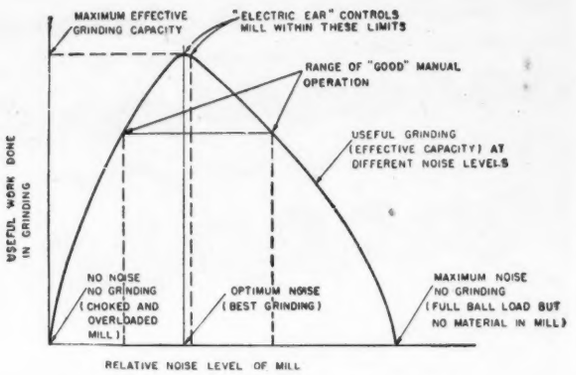
FOR THE MINING INDUSTRY

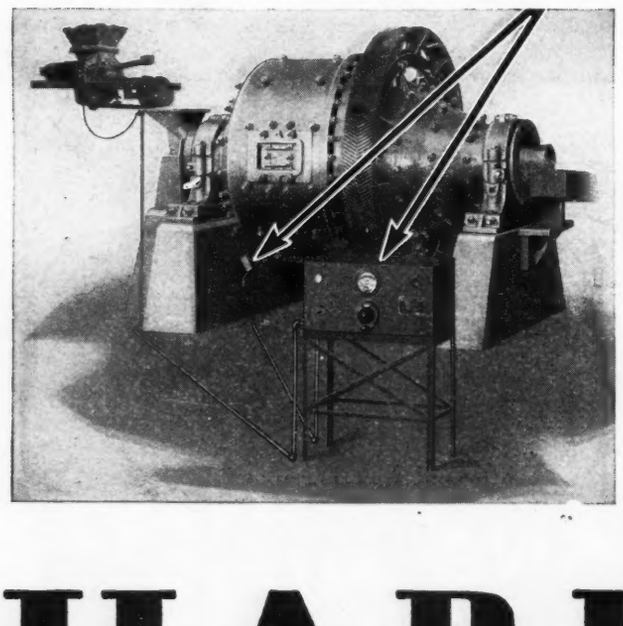
THE "ELECTRIC EAR"*

Controls the rate of feed to a Ball, Pebble, Tube or Rod Mill and maintains maximum grinding capacity

The unit "listens" to the noise of the mill and maintains a uniform noise level by reducing or increasing the feed rate to compensate for changes in grinding characteristics of the material resulting from bin segregation, moisture, and hardness of the material.

The maximum grinding capacity of any mill is dependent upon a proper pulp load in the mill, which is characterized by a certain noise level. The capacity drops due to an overload or underload, therefore, it is important that the sound level be held constant. In the manual control of the feed rate the operator is not able to hold this sound level in a narrow range. The graph illustrates the range of noise level (capacity) for manual operation also "Electric Ear" control.


MAXIMUM EFFECTIVE GRINDING CAPACITY
"ELECTRIC EAR" CONTROLS MILL WITHIN THESE LIMITS
RANGE OF "GOOD" MANUAL OPERATION
USEFUL GRINDING (EFFECTIVE CAPACITY) AT DIFFERENT NOISE LEVELS
USEFUL WORK DONE IN GRINDING
NO NOISE NO GRINDING (CHOKED AND OVERLOADED MILL)
OPTIMUM NOISE (BEST GRINDING)
MAXIMUM NOISE NO GRINDING (FULL BALL LOAD BUT NO MATERIAL IN MILL)
RELATIVE NOISE LEVEL OF MILL



Several hundred successful installations have shown that a 10 to 15% increase in mill capacity may be expected when the "Electric Ear" is installed.

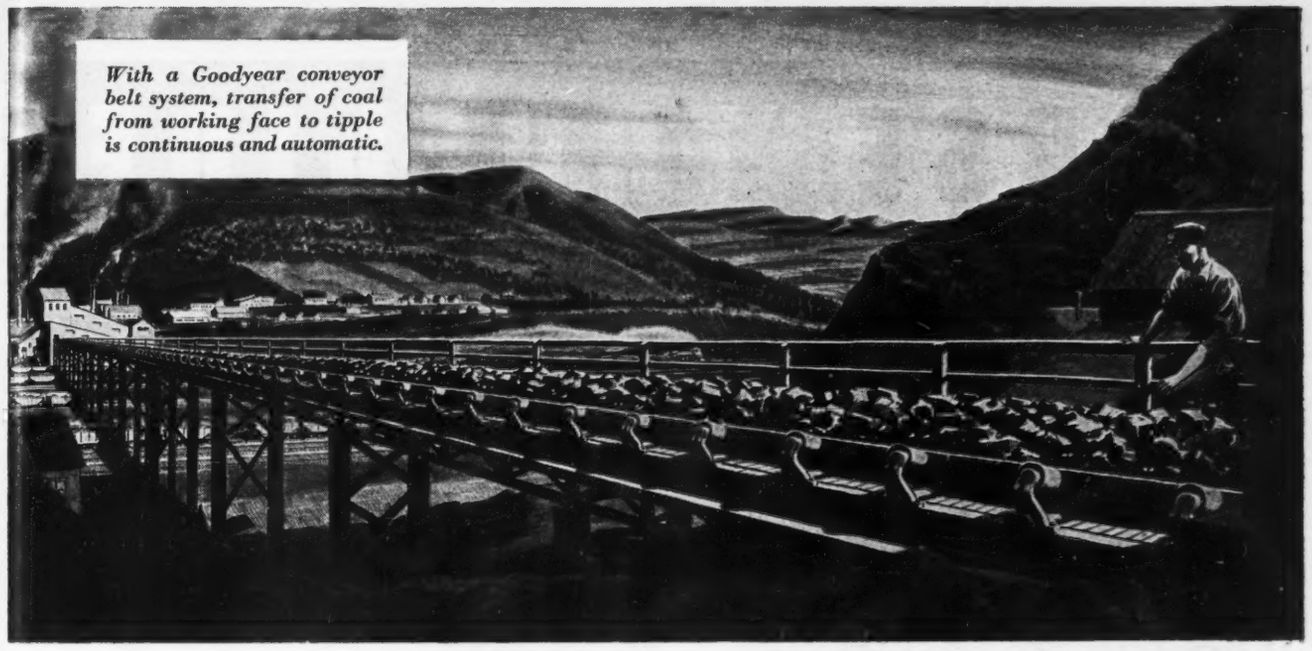
If you are operating a Ball, Pebble, Tube or Rod Mill, write for information and bulletin 42.

** Reg. U. S. Pat. Office.*

HARDINGE

COMPANY, INCORPORATED - YORK, PENNSYLVANIA

New York, 122 East 42nd Street Chicago, 205 West Wacker Drive San Francisco, 501 Howard Street Toronto, 200 Bay Street



With a Goodyear conveyor belt system, transfer of coal from working face to tipple is continuous and automatic.

Surest way to keep a coal mine out of the red!

• A new era is here in bulk transportation •

How can coal compete with other fuels without going into the red—in the face of higher mining costs?

The Goodyear conveyor belt haulage system, from working face to loading tipple, is by far the lowest-cost-per-mile transport ever developed.

Many Goodyear belt systems—some miles long—in operation in large mines for several years, show these important economies:

Continuous belt haulage works loading machines faster and more efficiently—and there's no lost time in spotting cars. No track- and switch-laying. No bonding. No heavy grading—belts operate successfully on grades up to 32 per cent. Belts require less headroom in low seams, reduce timbering and deadwork. With less breakage in transit, you get 12 to 15 per cent more lump coal.

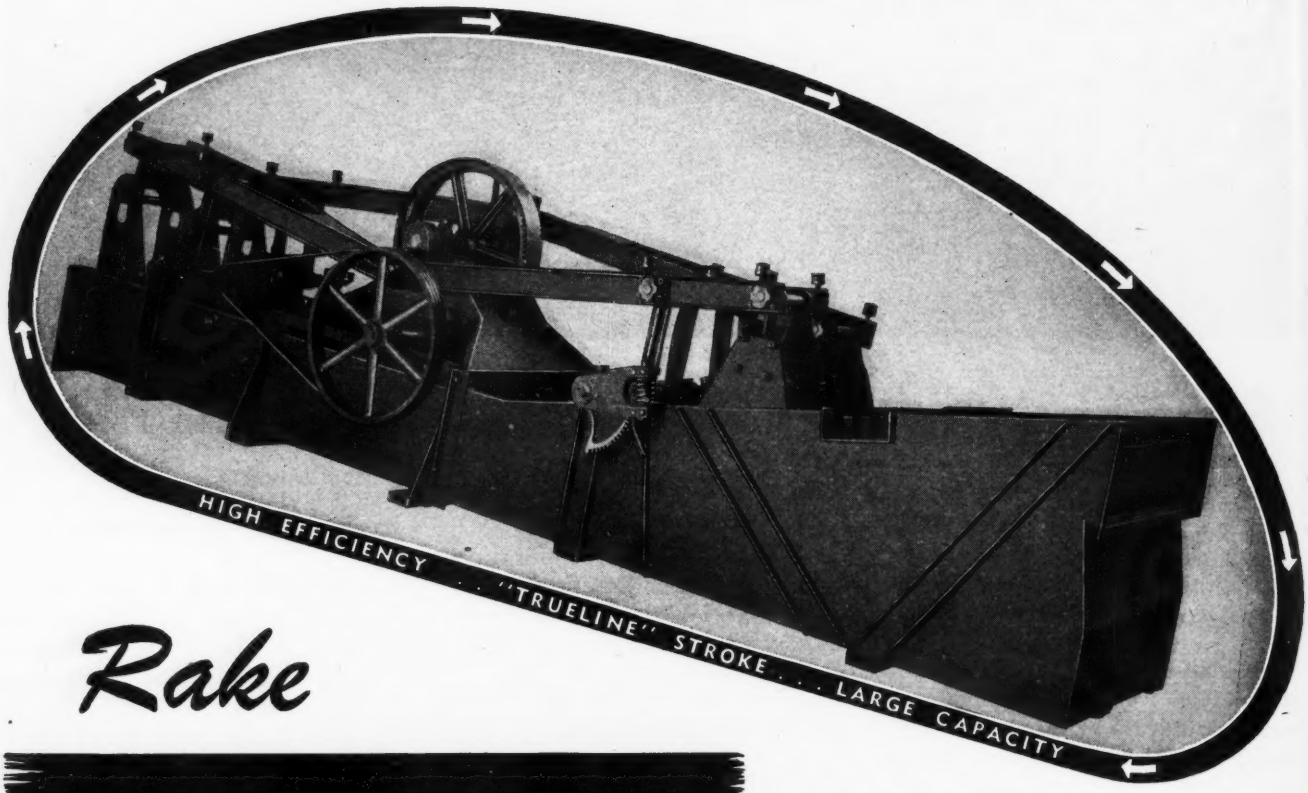
Practically automatic operation demands only a small maintenance crew. Positive control eliminates runaway loads, lessens traffic accidents and injury claims. Lighter over-all weight of moving equipment reduces power cost.

Over half a million feet of Goodyear belting is now serving "mechanized" mines in underground service to increase vital tons-per-man-per-shaft production. Have you investigated the possibilities of mechanizing your properties?

Consult the G.T.M. — Goodyear Technical Man — on present and postwar plans. He can also advise you on Goodyear's quality line of war-grade belts, hose and other industrial goods available in either natural or synthetic rubber. Write Goodyear, Akron 16, Ohio or Los Angeles 54, California—or phone the nearest Goodyear Industrial Rubber Goods Distributor.

★ ★ ★ ★ ★ ★ ★ ★ ★
★ To Hasten Victory ★
★ BUY MORE ★
★ WAR BONDS ★
★ ★ ★ ★ ★ ★ ★ ★ ★

MORSE "TRUELINE"



Rake CLASSIFIERS

Morse **"TRUELINE" CLASSIFIERS are mechanically correct, metallurgically efficient and operate with low maintenance. The mechanisms are compact, simple to maintain and give smooth mechanical performance during continuous operation.**

Only minimum head room requirements are necessary. All "Trueline" classifiers have machine-cut tooth gears, rake lifting devices and a comparatively few moving parts to grease. Simplex and duplex styles are identical in principle and vary in width from the 18-inch simplex up to 8-foot duplex. Rake strokes vary from 8-inch to 16-inch in length, depending on the size of the classifier and the duty to be performed.

The exclusive Morse "Trueline" mechanism imparts long straight line rake strokes that produce the highest sand raking capacities. All "Trueline" classifiers have large pool areas to give consistant and uniform efficiency of the classifier overflow. Sturdy fabricated mechanisms and heavy reinforced steel tanks contribute to the successful mechanical performance of these outstanding classifiers.

Write for Bulletin 437

MORSE BROS. MACHINERY CO.

ESTABLISHED 1898

MB

P. O. BOX 1708 • DENVER, COLORADO, U. S. A. • CABLE "MORSE"

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SANTIAGO SOTO MARTINEZ, EDIFICIO JALISCO 503-EJIDO 7, MEXICO, D.F.

Continuous High Capacity Underground Loading and Transportation

GOODMAN SHAKER CONVEYORS

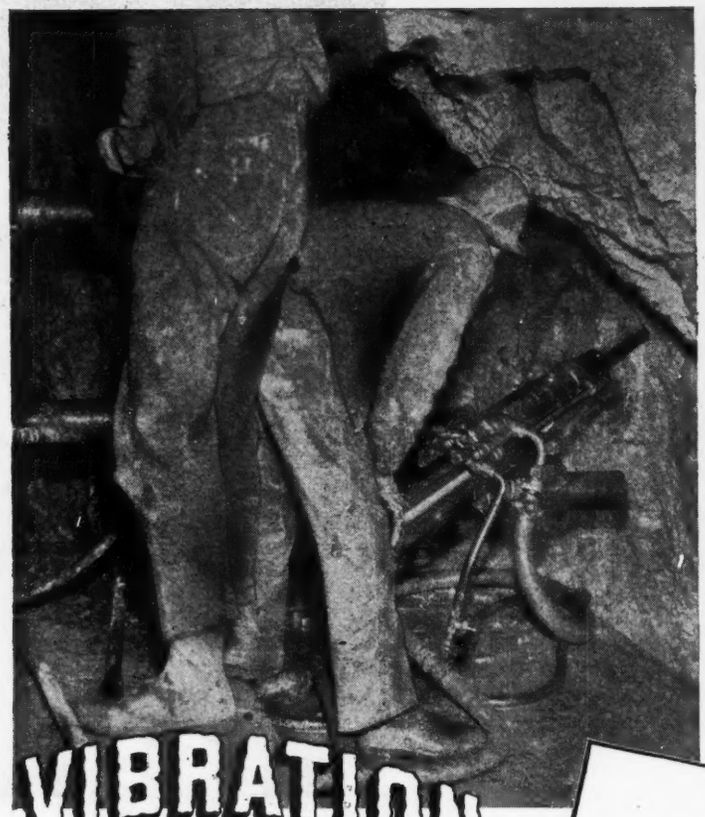
Above:
A shaker conveyor moving ore in a narrow drift.

Left
Loading rock with a Duckbill shaker conveyor.

ARMY E NAVY

GOODMAN MANUFACTURING COMPANY

HALSTED STREET AT 48TH • CHICAGO 9, ILL.

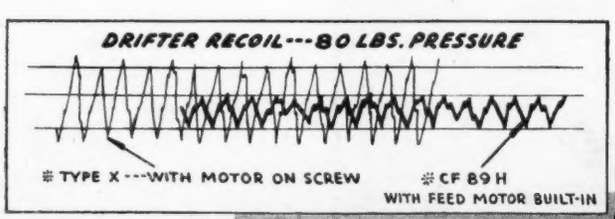


VIBRATION *is the great foe of drilling efficiency. That's why the reduced vibration of Gardner-Denver CF Continuous Feed Drifters increases drilling speed and power.*

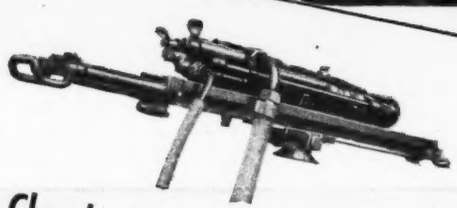
LESS VIBRATION ON THE JUMBO ... ON THE COLUMN ...

Reduced vibration of Gardner-Denver Continuous Feed Drifters assures less vibration on the jumbo—less vibration on the drill column. Because the Gardner-Denver Continuous Feed Motor is built into the drill proper, its weight dampens vibration—aids in absorbing recoil. Not only are drilling speed and efficiency increased, but over-all maintenance is kept below that of a hand-cranked drill.

Recoil tests demonstrate the low vibration of Gardner-Denver Continuous Feed Drifters compared with an automatic drill having the feed motor mounted on screw. This chart shows results of recoil tests—



A bulletin, further describing the advantages of Gardner-Denver Continuous Feed Drifters, may be obtained by writing Gardner-Denver Company, Quincy, Illinois.



Check These Additional Continuous Feed Advantages

★ Only one air hose is used—eliminating any need for a separate feed motor hose.

★ All controls are grouped together on the drill backhead, giving the operator convenient control over the drill at all times.

★ Shorter over-all length—actually less than a crank-fed mounting of corresponding steel change—permits greater pitch for drilling cut holes.

★ Enclosed construction of drill and continuous feed motor protects against dust and sludge.

★ Feed motor air consumption is negligible—enabling Gardner-Denver Continuous Feed Drifters to replace hand-cranked drifters without requiring additional compressor capacity.

★ A feed motor maintenance cost of less than 2c per shift throughout a 17-month period is the record of 13 Gardner-Denver Continuous Feed Drifters.

GARDNER-DENVER *Since 1859*

CHECK YOUR OPERATIONS for Maximum Dozer Use

Use this handy LeTourneau check-list

It's planned to cover your complete clearing & earthmoving cycle . . . shows you what to look for at every operating step

It pays to check your equipment operating procedure regularly. If you feel that you're not getting maximum use from your tractor-Dozer rigs, use this simple LeTourneau check-list. It will quickly show you where your job is falling down and what to do to correct the situation.

Here's More Help

To keep your tractor operators and repair crews informed on the most practical operating, service and repair practices, The LeTourneau Co-Operator is offered to you and your men FREE. Published 10 times yearly. Read regularly by over 50,000 miners, contractors, loggers and others who operate and care for LeTourneau equipment . . . write for your copies TODAY. Just address: Dept. EMJ-12, R. G. LeTourneau, Inc., Peoria, Illinois.

LeTourneau Dozer building access road to new ore body on a California mining property. On steep, side-hill work like this, keep cut low on the inside, next to the bank, to eliminate tendency of tractor to slip off the loose edge of the fill.

CLEARING . . . Check These Points	√
1. Use your largest, heaviest tractors and Dozers to take out trees up to 3 feet in diameter. Here's how . . .	
2. Check tree to remove dead limbs that might fall and injure operator.	
3. Saucer out dirt to cut roots opposite "fall" side of tree.	
4. Take a bite on either side of stump to cut and loosen roots.	
5. Apply Dozer blade high up trunk for extra leverage and rock tree a few times to loosen—then push tree over and/or . . .	
6. Reach blade under root ball for final push.	
7. In all clearing and Dozer earthmoving operations, use LeTourneau front end Power Unit wherever possible; this leaves rear of tractor free for mounting LeTourneau 2-drum Power Control Unit to operate Carryalls, Tractor Cranes, etc.	

LOADS . . . Check These Points	√
1. Dozer bowl should always carry a heaping load.	
2. Tractor motor should be working under full load by keeping up a full r.p.m.	
3. Correctly set the blade—angled or straight, tilted or level—for the work.	

TRAVELING . . . Check These Points	√
1. 1½ m.p.h. travel speed—or low gear—should be used.	
2. Back-up should be made in the highest gear possible.	
3. Efficient haul distances should be no longer than 200 or 300 feet.	
4. Doze loads in a trench or "slot" wherever possible.	
5. Always doze downhill with loads. It's almost always possible.	
6. Where 2 or more tractors are available—work them side-by-side to move an extra yard or two between Dozer bowls.	

SPREADING . . . Check These Points	√
1. Spread as quickly as possible.	
2. Spread earth in lifts or layers as required and get rid of it quickly.	
3. As soon as spread is completed, don't waste time beginning back-up or return.	

MECHANICAL—(Check with LeTourneau Maintenance Manuals)	
1. Check all adjustments on Power Control Unit and Dozer.	
2. Blades should be installed properly to keep it sharp.	
3. Cable must be free from binding and all sheaves running free.	
4. Lubricate sheave bearings every 8 hours.	
5. If rear Power Control Unit is used, right-hand drum should carry cable.	

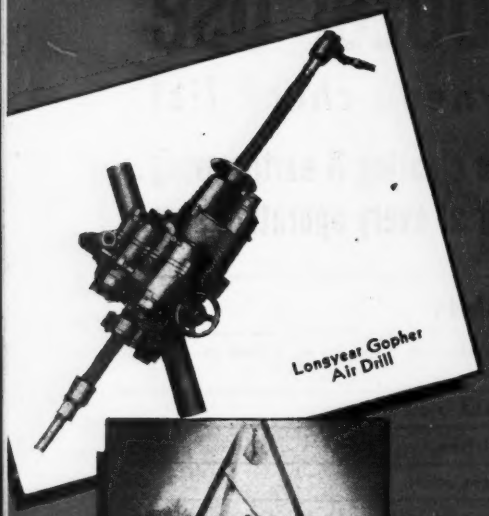
Check with Your Dealer—If your check-up shows a need for repairs or parts, call your LeTourneau-"Caterpillar" distributor—he's equipped to handle your repair job quickly, thus reduce costly down-time. Check with him NOW.

ARMY NAVY E

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

STRATEGIC METAL DEMANDS "*Bite*" INTO ORE RESERVES



Build up your ore reserves with Longyear Diamond Core Drills. In addition to the UG Straitline and the Gopher there is a complete line from which to make selection. Information will be given gladly.

● Producers of strategic metals are drawing heavily on ore reserves to meet war production schedules. These reserves must be replaced and increased in order to sustain active mine operations. You simply "cannot get out of a bag more than is in it." What's required, then, is a sound core drilling program for building up reserves.

Likely areas should be probed with a few rightly placed drill holes. When an ore body is discovered or known to exist, core drilling will rapidly give you its location and size. Also, the physical character and grade of ore are determinable by inspection and analysis of core and sludge samples recovered. Often a few holes underground from drift or stope walls reveal unsuspected ore of considerable value. Not only does core drilling yield accurate data, it is rapid and far more economical than exploratory shafts, drifts or raises.

RESERVE-BUILDING LONGYEAR DRILLS ARE AT YOUR SERVICE

Our job is to supply you with powerful, fast Longyear core drills for drilling from surface or in underground development

SURFACE USE: Exploratory search for new ore reserves by drilling from surface is successfully accomplished with Longyear core drills. Selection may be made from a number of models of various capacities. As an example, if moderately deep drilling is required, say, up to 1,750 feet, the LONGYEAR UG STRAITLINE gas-driven as illustrated, will give you top-notch performance. It is strongly built for tough, steady drilling; smooth in operation; easy to handle. A 7/8" diameter core is recovered to the depth stated. Where larger core is desired, the capacity is slightly reduced. There is a 4-speed transmission. Either a screw feed or hydraulic type of drilling head is available. The UG STRAITLINE is suitable for underground drilling when equipped with an air or electric power unit. Bulletin E-57.

UNDERGROUND USE: Often the limits of a known ore body can be expanded by underground drilling. With smaller Longyear models, air- or electric-driven, drift and stope walls can be tested; a "lost" vein located; ore blocked out ahead of mining. Our latest drill for these purposes is the streamlined LONGYEAR GOPHER. The air motor and feed screw, driven by spur gears, form an integral unit. This gives you full power without loss. A new arrangement of widely-spaced bearings permits a 24-inch length of feed with practically no vibration. Model 30, with high bit speed, has a capacity of 250' of 7/8" core. Model 15, with standard speeds, has a capacity of 500' of the same size core. The Gopher is adapted for either core or blast hole drilling. Bulletin E-64.

E · J · LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO

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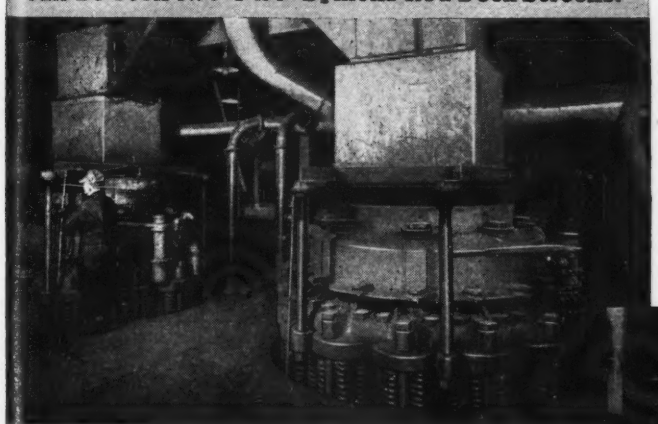
CONES do the fine crushing of Adirondack iron ores

BENSON MINES

Two 7 ft. Short Head Cones. Above the crushers can be seen two 4' x 8' Symons Rod Deck Screens.

AMONG the newly developed and expanded iron ore properties in the Adirondack region of New York State, Symons Cone Crushers are doing the fine crushing just as they are in most metal mining operations. The ability of this crusher to deliver a more finely crushed product in greater capacity has made it the choice wherever output and low cost operation are considered in the selection of the type of reduction crusher best suited for the service. In addition to the newer installations shown, five more Cones are serving older Adirondack mines. Other equipment built by Nordberg contributing to the production of iron ore from this field includes a number of Mine Hoists and Rod Deck Screens.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN
NEW YORK • LOS ANGELES • LONDON • TORONTO



MacINTYRE MINES

5½ ft. Standard and Short Head Cones.

FISHER HILL MINES

7 ft. Standard and Short Head Cones.

SYMONS CONE CRUSHERS

A CHROME MINE GETS A "SHAVE"

Above: "Shaving" Chrome deposits with A-C tractor and Gar Wood scraper, and (right) hauling the heaped loads to the draw hole.

Left: Here the powerful Allis-Chalmers, HD-7 2-Cycle Diesel, equipped with a Gar Wood bulldozer, pushes the vital material through the draw hole and on to a conveyor belt.

Serving the war effort in countless ways . . . powerful, Allis-Chalmers 2-Cycle Diesel tractors are also proving to be ideal units for mining Chrome — one of the essential materials of war.

Such an operation, conducted near Marshfield, Oregon, by the Krome Corporation, is proving highly successful. Large capacity scrapers, pulled by tractors, "shave" and load the slightly-cemented beach sands, which contain 4 to 6 per cent of chrome . . . then speedily haul the material to a draw hole, where it is bulldozed on to a conveyor belt by another tractor. From here it travels to the company's 2,000-ton concentrator where a 25 per cent concentrate is produced. It is brought up to 40 per cent chrome — suitable for use by the steel industry — at the company's magnetic plant near Marshfield.

The flexibility of these 2-Cycle Diesel tractors make them readily adaptable for many jobs . . . in addition to handling your road-building, stripping, hauling and similar work. Put one of these units on your operation and you will find it a profitable investment. Pays for itself many times over!

Under a government regulation, 15 per cent of our crawler tractor production is released for essential civilian use. You may be able to qualify for a new outfit. Why not check with your Allis-Chalmers dealer . . . NOW!

ALLIS-CHALMERS

TRACTOR DIVISION · MILWAUKEE · U. S. A.

ARMORED

for the battle of tonnage—

Our fighters in uniform deserve and get the finest in protective equipment —the better to win offensive battles. Over half-a-million of our mining soldiers of production enjoy the protective armor of *more effective light* and *better head safety* in winning new tonnage records for victory. For many years the superior strength and dependability of the Edison Electric Cap Lamp has been proved in mining operations everywhere; the record of lives saved and injuries averted by the M.S.A. Skullgard is part of mining history. The value of this equipment today, when the need is greatest, is reflected in the stepped-up output of mining material and lowered accident rates established wherever Edison Lamps and Skullgards are employed.

For outstanding production achievement · · · the Maritime "M" Pennant and Victory Fleet Flag, awarded to M·S·A by the U. S. Maritime Commission.

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EDISON ELECTRIC CAP LAMPS

M.S.A. SKULLGARDS

It's the full 3 INCHES of "DEAD-CENTER" CONTACT that does the trick

O-B TYPE L TROLLEY SHOES

Prevent Harmful Arcing---Eliminate Burning

"Point" Contacts---Decrease Dewirements

BUY WAR BONDS

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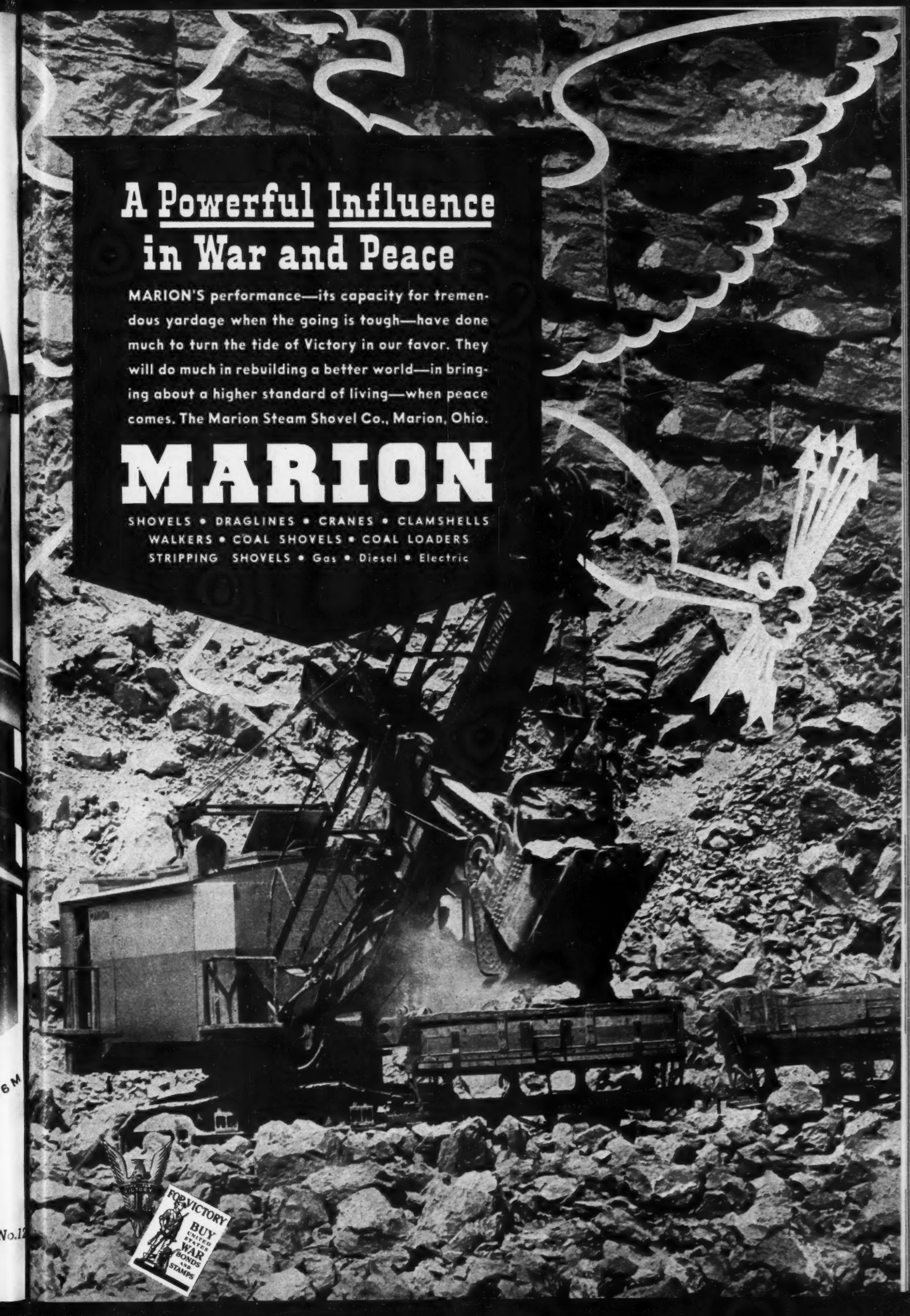
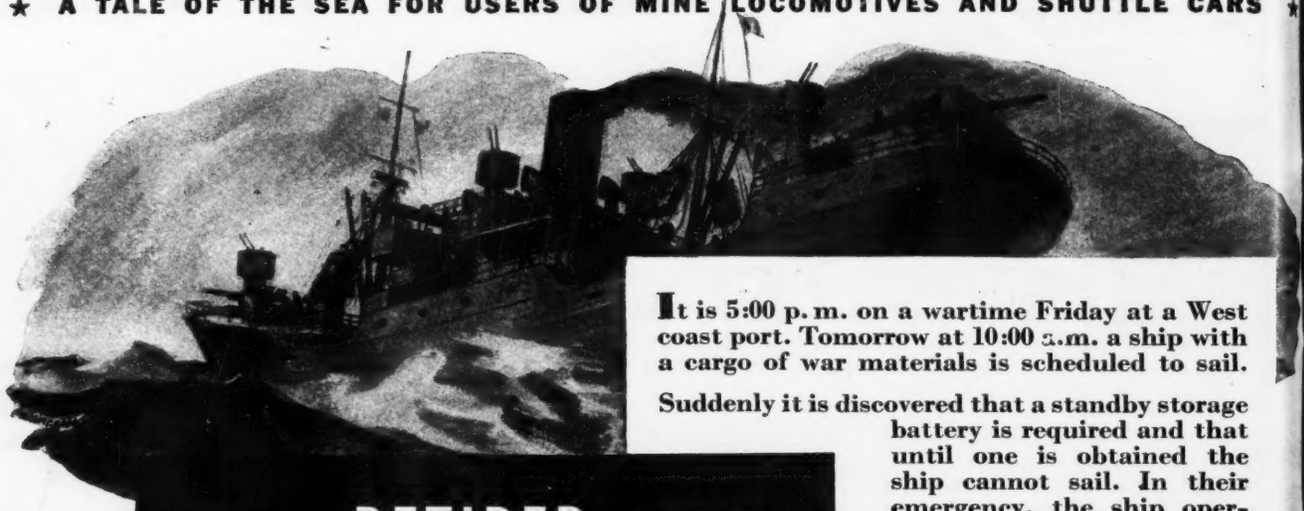
SEND FOR BOOKLET 766M

2378-M


A Powerful Influence
in War and Peace
MARION'S performance—its capacity for tremendous yardage when the going is tough—have done much to turn the tide of Victory in our favor. They will do much in rebuilding a better world—in bringing about a higher standard of living—when peace comes. The Marion Steam Shovel Co., Marion, Ohio.
MARION
SHOVELS • DRAGLINES • CRANES • CLAMSHELLS
WALKERS • COAL SHOVELS • COAL LOADERS
STRIPPING SHOVELS • Gas • Diesel • Electric
FOR VICTORY
BUY
UNITED STATES
WAR
BONDS
AND
STAMPS

★ A TALE OF THE SEA FOR USERS OF MINE LOCOMOTIVES AND SHUTTLE CARS ★



HOW A RETIRED BATTERY SPED A SHIP TO WAR

It is 5:00 p.m. on a wartime Friday at a West coast port. Tomorrow at 10:00 a.m. a ship with a cargo of war materials is scheduled to sail.

Suddenly it is discovered that a standby storage battery is required and that until one is obtained the ship cannot sail. In their emergency, the ship operators phoned a local Edison engineer. Could a new alkaline battery be supplied from local stock? It could not. Then what could be done? "Perhaps," the Edison Engineer suggested, "our marine distributor could lend you a battery made up of used cells, until the new one can be shipped from our factory."

"See if they can," was the reply.

They could. They rounded up old but still serviceable cells; charged them during the night, and by 5:00 a.m. had assembled them into a battery and installed the battery on the ship. At 8:00 a.m. the official inspectors tested it and pronounced it satisfactory in every way. At 10:00 a.m. the ship sailed—on schedule. In normal times, this would not be considered good battery engineering. But that is not the moral of the narrative. The moral is that Edison Alkaline Batteries, even after they are old and perhaps no longer capable of delivering full rated capacity, nevertheless provide highly dependable service.

This quality, always available, is proving especially valuable in wartime . . . in the locomotives that are hauling coal and ore from the working places of American mines . . . in the industrial trucks that are handling materials in the war industries and the distribution depots of our armed forces . . . in the carlighting and signal systems of American railroads . . . in military uses where battery failure would be intolerable.

Some of the characteristics which account for this extra reserve of dependability in an Edison Alkaline Battery are cited in the column at left.

ADVANTAGES OF THE EDISON ALKALINE BATTERY IN MINE LOCOMOTIVES AND SHUTTLE CARS

★ It is durable mechanically. High strength steel construction is used in the container, grids, pole pieces, etc. The electrolyte is a preservative of steel.

★ It is foolproof electrically. It may be short-circuited, over-charged, over-discharged, or even accidentally charged in the reverse direction without injury.

★ It can be charged rapidly. It may be charged at full normal rate throughout the entire length of charge. It requires no equalizing.

★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.

★ It is free from ordinary battery troubles. It is not subject to sulphation, shedding of active material, buckling of plates, jar breakage or other common causes of battery failure.

★ It does not require critical adjustment of charge rates. It can be charged directly from the d-c mine power supply. It has no finish-rate limitations.

★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.

★ Its tray assembly and cell connections are extremely simple.

★ Its life is so long that its annual depreciation is less than that of any other type of storage battery.

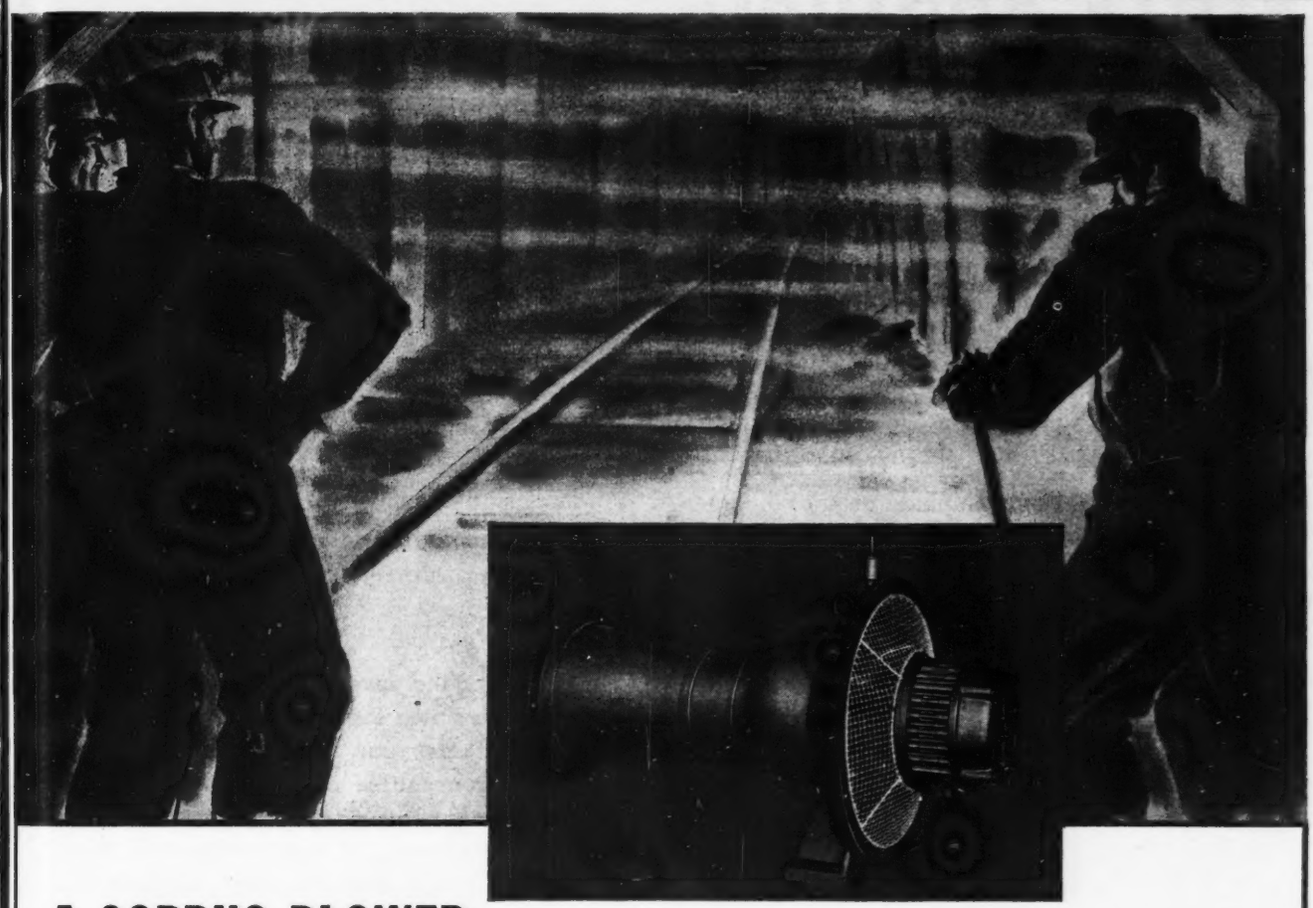
EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

Edison

ALKALINE BATTERIES

Save the Wasted Hours

WAITING FOR AIR TO CLEAR



A COPPUS BLOWER WILL GET THEM BACK TO WORK ... *FASTER,* *AT LESS COST TO YOU* ... THAN OTHER METHODS OF CLEARING THE AIR

You can use an electric motor driven Coppus Blower and get more air from 2 H.P. than you would get from a 5 H.P. fan of the ordinary type!

You can use a compressed air driven Coppus Blower and get, for example, 1400 cu. ft. of ventilating air from only 21 cu. ft. of compressed air!

Coppus Blowers are designed and built expressly for mine use. They are portable (lighter in weight than other types) and rugged enough for long life in severe service.

Get more facts on the blowers that carry the famous Coppus "Blue Ribbon" — a blue band that signifies quality workmanship and materials. Bulletins 121-3 (compressed air) or 122-3 (electric motor) are free — write Coppus Engineering Corporation, 442 Park Avenue, Worcester, Mass.

SPEED STRATEGIC ORES

Rapid advance of main headings, 10 minutes after blasting — quick, safe driving through old workings — economical, safe air for reopening old mines — are among the many good results obtained by using Coppus VENT-AIR (centrifugal type for high pressures, long pipe lines) or VANO (propeller type for medium pressures, shorter lines) in war-essential mining operations.

COPPUS

THE MINE VENTILATION PEOPLE

COPPUS BLUE RIBBON PRODUCTS

See THOMAS' REGISTER. In METAL & NON-METALLIC MINING CATALOGS: Coppus Air Filters for motors, generators, air compressors, internal combustion engines. Other Blue Ribbon Products: Steam Turbines, Coppus-Dennis Fanmix Gas Burners, Heat Killers, Blowers, Exhausters for Special purposes.

SODIUM ETHYL XANTHATE

Z-4 For Selective Flotation of Sulphide Ores

In the recovery of vital lead, copper and zinc, Bear Brand *Sodium Ethyl* Xanthate—Z-4—finds widespread acceptance. Z-4—like Z-3 (Bear Brand Potassium Ethyl Xanthate)—is used on copper-iron sulphide ores, metallic copper ores, lead sulphide, zinc sulphide, lead-zinc sulphide, lead-zinc-iron sulphide, copper-lead-zinc-iron sulphide ores and generally for most sulphide minerals.

Although Z-3 and Z-4 can be used for the same purposes the latter is preferred by some operators because of its higher percentage of Xanthate content.

The wide range of properties of the seven Bear Brand Xanthates makes them ideally suited for flotation processes. All Bear Brand Xanthates can be shipped long distances and stored for reasonable periods without appreciable loss of efficiency. This stability factor, coupled with uniformity, extreme ease of application and high flocculating power, makes these flotation reagents indispensable for fast and profitable operation.

*From Sharples Amyl Alcohol

GREAT WESTERN DIVISION · BEAR BRAND PRODUCTS · THE DOW CHEMICAL COMPANY

DOW

TRADE MARKS REG. U. S. PAT. OFF.

GREAT WESTERN DIVISION
THE DOW CHEMICAL COMPANY
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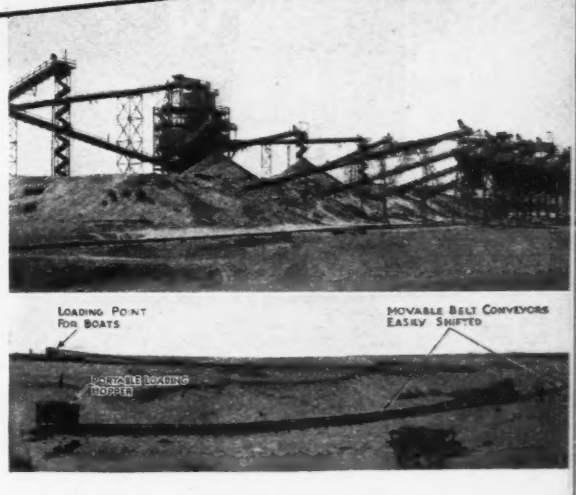
BEAR BRAND XANTHATES

AS TIME GOES BY...

Designs Change... but S-A Quality Remains the Same



● Changing times bring changing needs. The need for new and better labor-saving, conveying methods is always present. We at Stephens-Adamson have always held it primarily important not only to stay abreast of new developments . . . but to anticipate and constantly plan for them.

Right now, this aspect of S-A activity has *double* significance . . . (1) the solution of your present problems . . . (2) the solution of new handling problems connected with new processes and products contemplated for the post-victory world.

STEPHENS-ADAMSON MFG. CO., 4 Ridgeway Ave., Aurora, Ill.

STEPHEN S-A DAMSON

MFG. CO.

Designers and Manufacturers of All Types of

BULK MATERIAL HANDLING EQUIPMENT

HIS SKILL WENT TO WAR

He was a good track man. But the fighting forces needed him, and so he went.

In mine track-laying operations, one way to get around the shortage of skilled manpower is to use Bethlehem Steel Ties. They not only last far longer but, because they are more quickly and easily installed, save many precious man-hours.

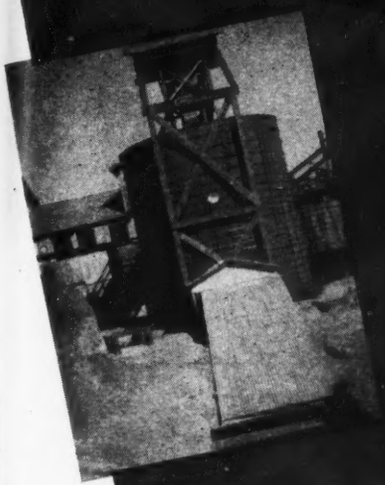
This is proved by time-study figures. It takes 4.55 times as many man-hours to lay 40-lb. straight track on wood mine ties as on steel. And it takes 3.30 times as many man-hours to remove or recover it. In other words, there's a possible man-hour saving of *78%* on installing, and *70%* on removing, steel ties.

Bethlehem Steel Ties have riveted clips that lock the rails rigidly in place and provide permanent gaging for the track. A hammer blow on the clip does the job of quick installing or dismantling. Write to Bethlehem Steel Company, Bethlehem, Pa., for Booklet 71 which gives complete information about Bethlehem Steel Ties and how they save money in mine operation.

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

BETHLEHEM PRODUCTS FOR MINES: Rails . . . Steel Ties . . . Frogs, Switches, Switch Stands, Turnouts and Special Trackwork . . . Track Bolts, Nuts and Spikes . . . Mine Cars, Wheels, Axles . . . Bars, Plates, Structural Shapes . . . Steel Construction . . . Steel Timbering . . . Pipe, Boiler Tubes . . . Galvanized Roofing, Siding . . . Wire Rope, Strand . . . Drill Steel.

"Build this Plant from the stuff we have on hand!"



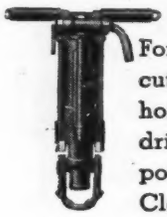
and e… the ha… Service… size un… engine… unique s… Flow sheets … resting photographs and descriptions of nineteen noteworthy W. K. E. jobs have been compiled in Bulletin W. K. E. 42. May we mail you a copy?

DESIGNING AND CONSTRUCTION ENGINEERS • COMPLETE MINE AND MILL INSTALLATIONS

WESTERN KNAPP ENGINEERING CO

760 FOLSOM STREET · SAN FRANCISCO · CALIFORNIA

LOS ANGELES · SACRAMENTO · SALT LAKE CITY · SPOKANE · DENVER · PHOENIX



For hand-held drifting, pop-holing, hitch cutting, drilling anchor holes for scraper hoist and haulage lines—in fact, for any drilling around the mine for which the 45-pound, hand-held drill is usually chosen—the Cleveland H10 is a universal favorite. The H10 is easy to hold, and is light enough to be readily supported in any position. Its rotation is strong, and it blows the hole with unfailing certainty.

You will like the H10's rugged durability, its habit of being always underground, where the drilling is done. Its end-seating valve improves with use—there is no increase in air consumption as the drill grows old in service. The efficient lubricating system takes care of even the hard-to-reach points like the flutes of the rifle bar and the forward chuck bearing. H10 is a drill that sticks around the mine a long time—*and it always delivers.*

All the standard chuck sizes are available, as is also a strong, rigid mounting for light drifting. H10 sinkers are obtainable with required priority on surprisingly quick delivery. Fully described in Bulletin 122, and in the new Cleveland catalog, just off the press.

BRANCH OFFICES

Birmingham, Ala.	Detroit, Mich.	Pittsburgh, Pa.
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Purves E. Ritchie & Son, Ltd., 658 Hornby Street, Vancouver, B. C.

BUY U. S. WAR BONDS AND STAMPS

The CLEVELAND ROCK DRILL CO.

Division of The Cleveland Pneumatic Tool Company

CABLE ADDRESS: "ROCKDRILL" • CLEVELAND 5, OHIO

LEADERS IN DRILLING EQUIPMENT

Ground protection insurance

When your mine distribution system has been engineered by Westinghouse you can be sure of adequate protection against the hazard of dangerous voltage between the shovel and ground. The importance of this safety feature cannot be emphasized too strongly. It has been proved that contact between shovel treads and the ground is *not* sufficient; ground resistance varies widely with location. For this reason ungrounded or solidly grounded systems are not safe.

To secure proper grounding it is not necessary to invest large sums in a completely new system. While requirements vary with the individual operating problem, there is an economical, reliable way to insure that your system exactly suits your needs, and at a minimum of expense. That way is to alter your existing system in accordance with a Westinghouse Planned Distribution System recommendation. There is no charge for this consulting service; and the Westinghouse representative will have your interests at heart, both from the standpoint of adequate protection and minimum investment. Call him today.

J-94554

Westinghouse

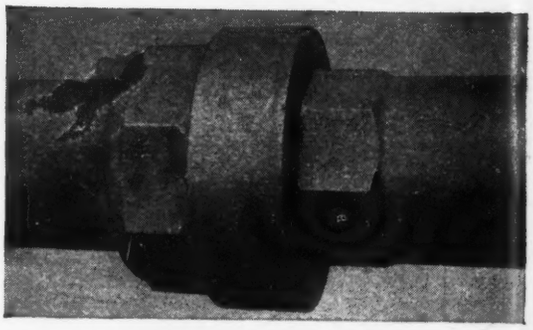
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Walworth Hi-Test Cast Iron Threaded Pipe

gives these three special advantages

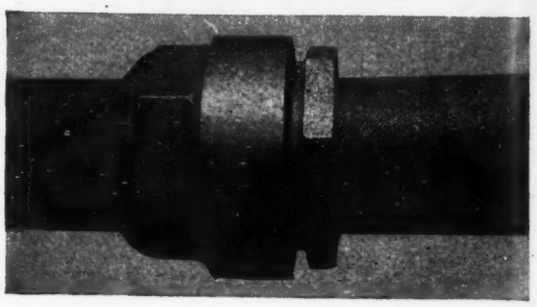
1 CORROSION RESISTANCE where it's needed most

Extra wall thickness at the threads in Walworth Hi-Test Oversize Threaded joint provides greater strength and resistance to corrosion.



2 TIGHT EXPANSION JOINTS

Hi-Test flexible expansion joints, available with Walworth Hi-Test Cast Iron Pipe, provide a tight connection and allow for 1½" expansion or contraction. There are no exposed threads or bolts.

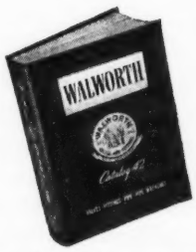


3 FLEXIBILITY IN THE LINE

Notice the unusual flexibility achieved with a Hi-Test expansion joint and two standard 20' lengths of 1¼" Walworth Hi-Test pipe.

Walworth I.P.S. Hi-Test Cast Iron Threaded Pipe with regular pipe size threads is primarily for use in drainage, vent and waste lines in buildings and for pipe lines above or below ground. It complies with Federal Specification No. WW-P-356, dated August 19, 1936, and is recommended in all sizes for 175 lbs. Non-Shock Cold Water Pressure.

Walworth I.P.S. and W.P.S. Hi-Test Pipe with oversize threads are principally for use in underground water and gas distribution systems. For complete details write for Bulletin 57.



You'll find pertinent information on Walworth's complete line of valves, fittings, pipe, and pipe wrenches in the new Walworth Catalog 42. Included are 78 pages of practical engineering data that simplify valve selection and make piping layouts easier. Write, on business stationery, for your free copy. Address: Walworth Company, 60 E. 42nd St., New York 17, N. Y. Dept. D8.

ARMY E ARMY E NAVY

BOSTON WORKS
KEWANEE WORKS

WALWORTH
valves AND fittings

WALWORTH VALVES AND FITTINGS ESTABLISHED 1842

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

HAZARD LAY·SET *Preformed* REWARDS YOU BY—

One of these invariably justifies its specification

1 LASTING LONGER
2 BEING SAFER TO HANDLE
3 SPOOLING BETTER
4 BEING FASTER TO INSTALL
5 REQUIRING NO SEIZING
6 REFUSING TO "PORCUPINE"
7 MAKING LANG-LAY MORE SERVICEABLE
8 BEING FREE OF TENDENCIES TO KINK
9 RESISTING BENDING FATIGUE LONGER
10 GIVING YOU GREATER DOLLAR VALUE

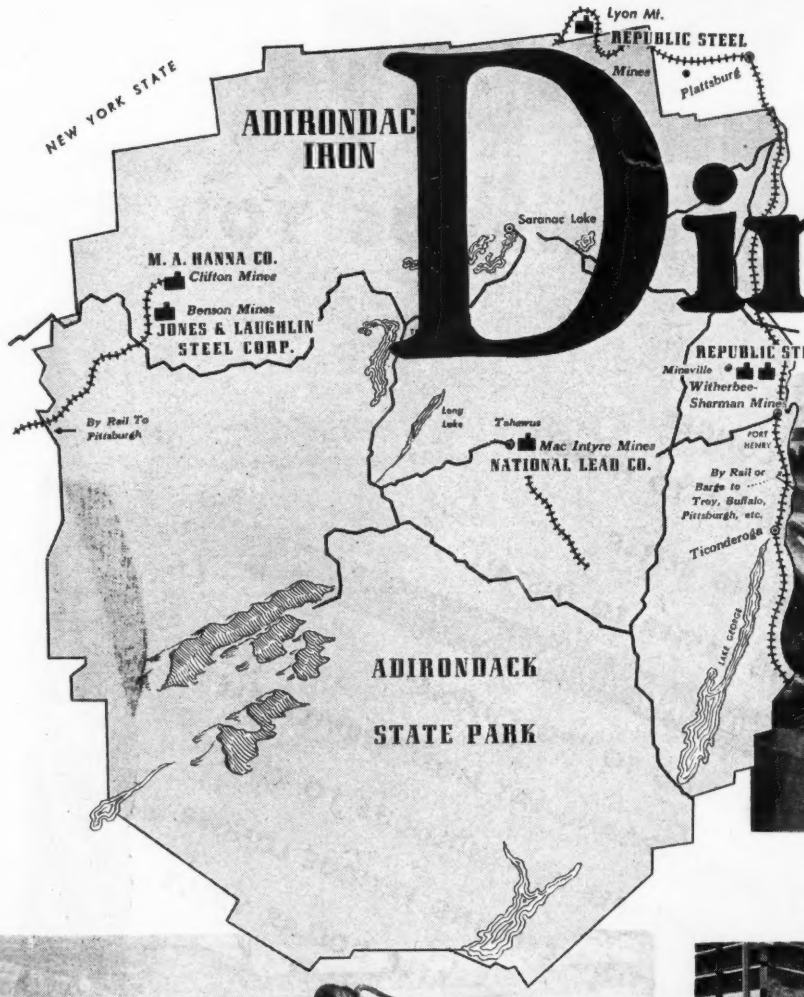
The absence of internal stresses in Hazard **LAY-SET** Preformed wire rope makes it unnecessary to seize the rope with serving wire before cutting. Every wire and every strand is "at ease," comfortable in its assigned position, not at straining odds with every other wire and strand as is the case with non-preformed rope. Here is proof positive that **LAY-SET** is easier, faster, and safer to handle; that being free of torsional strain it will work better, last longer, give greater dollar value. Specify Hazard **LAY-SET** Preformed for *all* its built-in advantages.

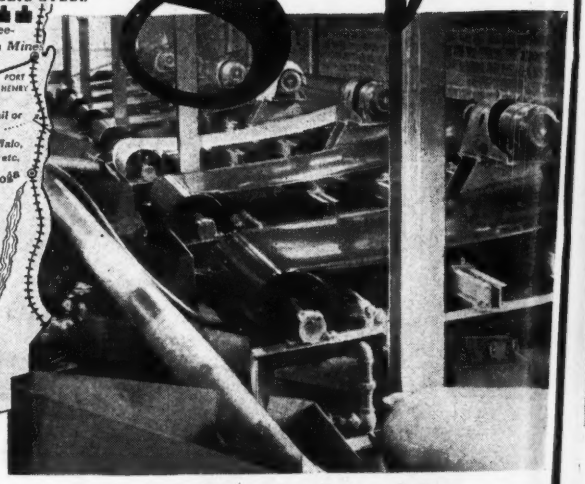
HAZARD WIRE ROPE DIVISION, Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Portland, Tacoma
AMERICAN CHAIN & CABLE COMPANY, INC. • BRIDGEPORT • CONNECTICUT

GREEN SIGNIFIES SAFETY

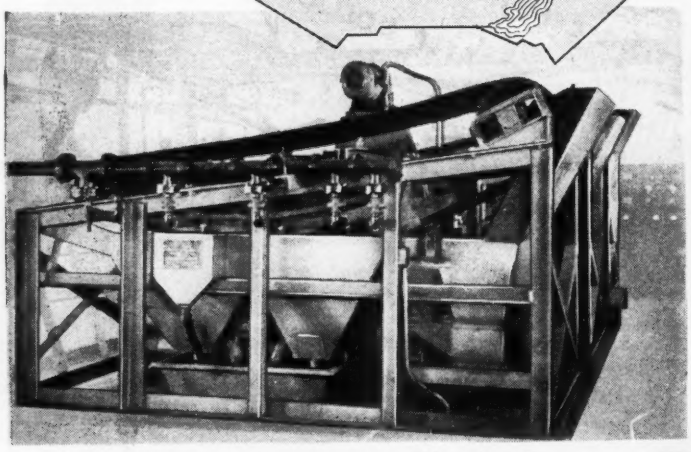
HAZARD LAY·SET *Preformed* WIRE ROPE

Dings for

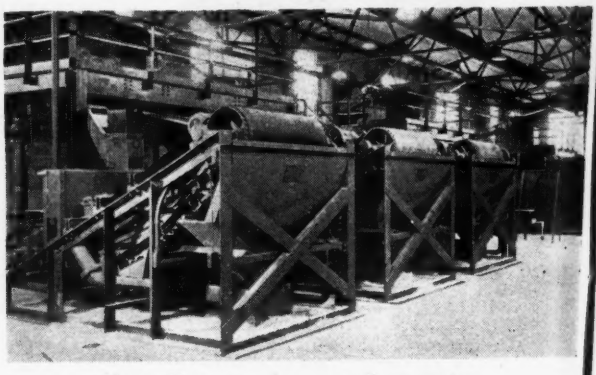




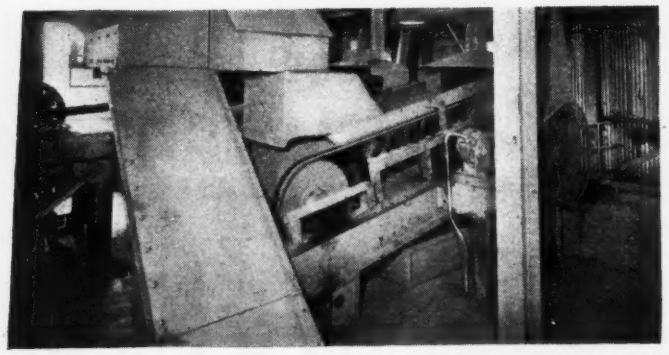
Above: Port Henry installation of Dings Crockett machines.



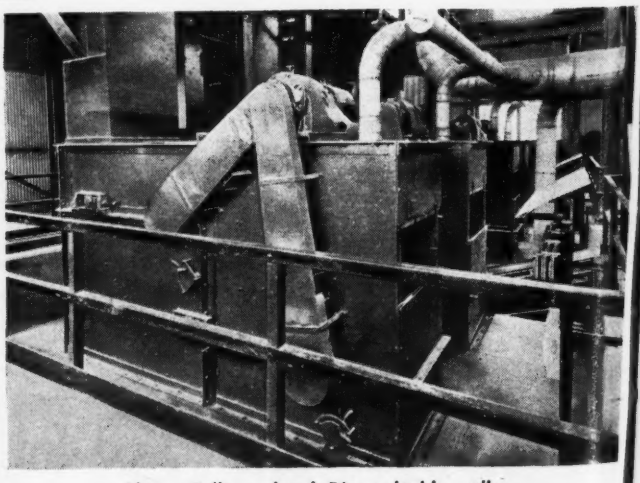
Above: Crockett type separators at Clifton Ore Corpany.



Above: Linney rougher magnetic separators, Fisher Hill.



Above: Clifton Mines, M. A. Hanna Company — Dings cobber type magnetic pulley.

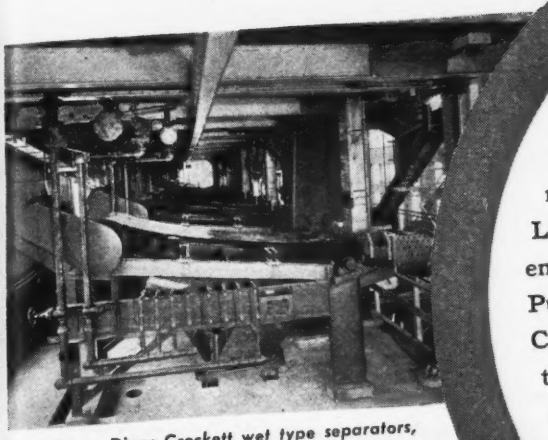


Above: Fully enclosed Dings double pulley type separators for cobbing, Fisher Hill.

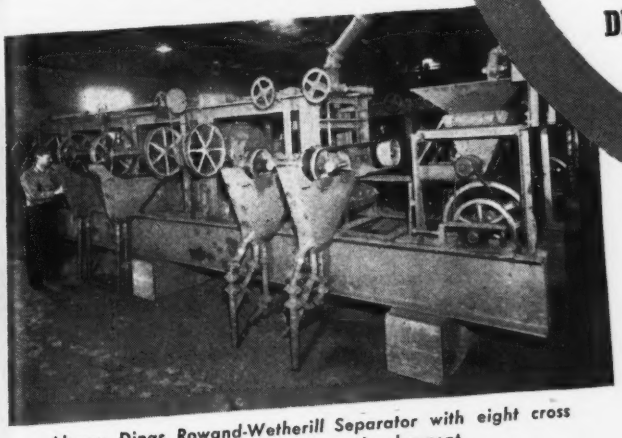
Magnetite Concentration

ONE of the most important factors in advancing the status of magnetite ores to their present important position has been the progress of the art of wet magnetic separation. Dings Crockett Type and Linney Type Separators are an integral part of the entire Adirondack development. Special Dings Cobber Pulley Type Separators and Dings Rowand-Wetherill Cross Belt Separators complete the magnetic separation picture in the magnetite mills. For data on wet separators, ask for Catalog 550; on pulleys, Catalog 250; on cross belt machines, Catalog 770.

DINGS MAGNETIC SEPARATOR COMPANY
526 East Smith Street
Milwaukee 7, Wis.

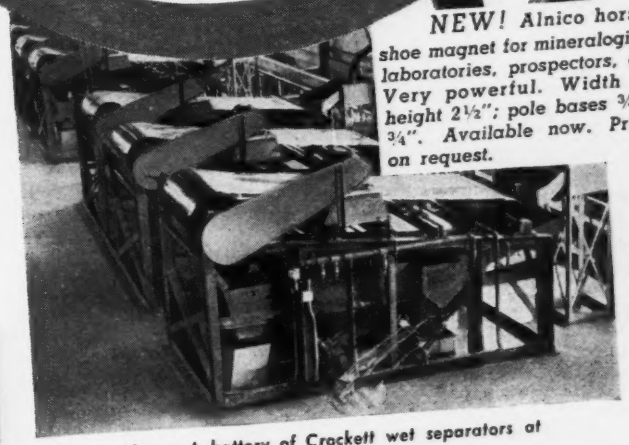


Above: Dings Crockett wet type separators, Benson Mines.



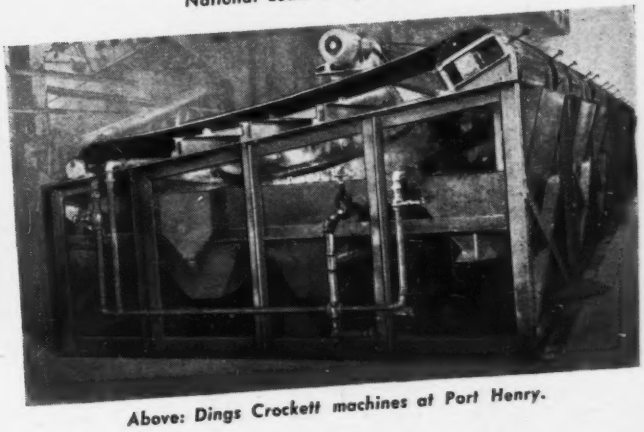
Above: Dings Rowand-Wetherill Separator with eight cross belts at the MacIntyre development

Above: Dings Linney type separators, Lyon Mountain.



NEW! Alnico horseshoe magnet for mineralogical laboratories, prospectors, etc. Very powerful. Width 3"; height 2½"; pole bases ¾" x ¾". Available now. Prices on request.

Above: A battery of Crockett wet separators at National Lead Company.



Above: Dings Crockett machines at Port Henry.

SOUTHWESTERN
OFFERS SEASONED EXPERIENCE *PLUS* MODERN ENGINEERING TECHNIQUE

A QUARTER century's engineering service to the mining industry throughout the world has brought together on SOUTHWESTERN'S ENGINEERING STAFF a group of seasoned testing, designing, constructing and operating engineers whose current accomplishments both at home and abroad make a record that speaks for itself.

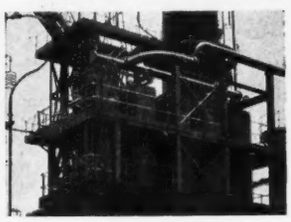
All the knowledge and skill developed in solving difficult and varied metallurgical problems are needed today when construction and operation must be kept *on schedule* despite severe wartime handicaps.

If your problem is one of designing or constructing a new mill, expanding an existing one, increasing operational efficiency, or the investigation of a new development, SOUTHWESTERN'S ENGINEERING STAFF is available to you for consultation and collaboration on the entire program or any part of it.

Regardless of size, location or the metallurgical character of the operation, SOUTHWESTERN is equipped to serve in every step. Your inquiry is invited.

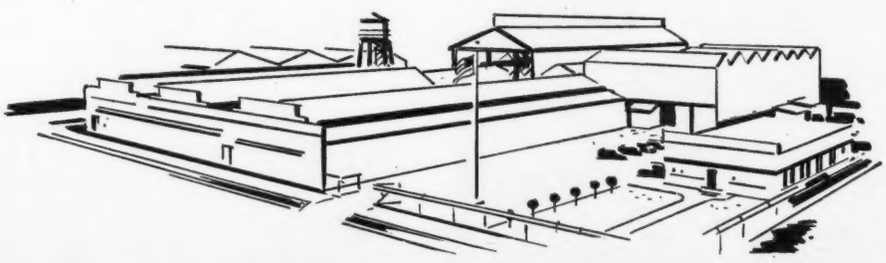
Laboratories equipped for small and pilot plant scale ore treatment testing are staffed by testing engineers who are qualified by practical experience in mill operation. Accurate, conclusive treatment investigation is the foundation for successful operation.

The Southwestern staff of specialists in the designing of ore treatment mills has demonstrated the soundness of its plans by the record of the many successful Southwestern engineered mills throughout the world.



All details of field construction are handled under unified direction. Seasoned construction personnel, geared to overcome wartime construction difficulties, have developed almost perfect coordination in maintaining schedules under present conditions.

Southwestern Service is available for complete supervision of operations for both existing and new plants. Southwestern supervision service may be used for an initial or tune-up period or on a permanent basis.



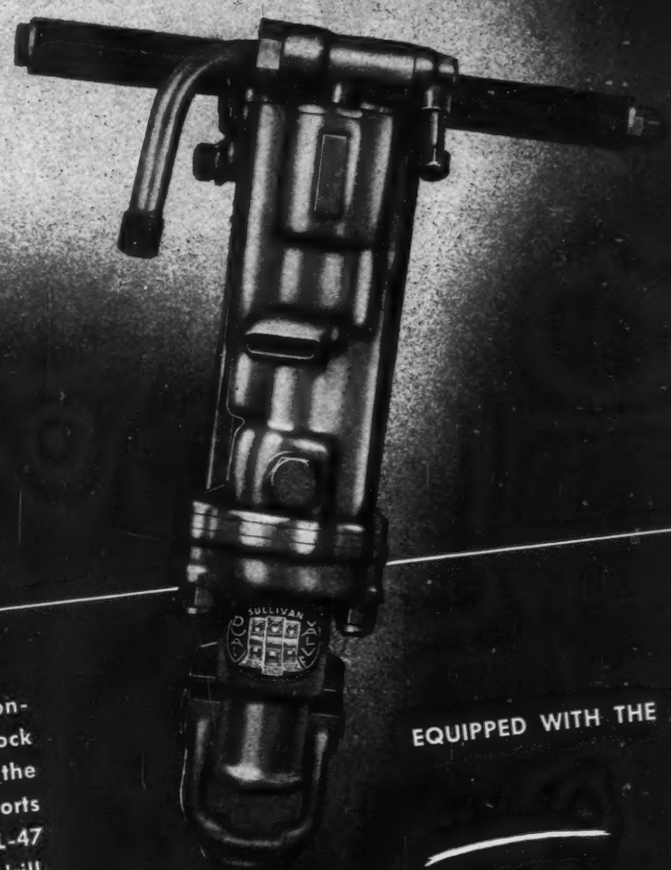
SOUTHWESTERN
ENGINEERING COMPANY

4800 Santa Fe Ave. • Cable Address: Southeng • Los Angeles 11, Calif., U. S. A.

55 POUND PERFORMANCE

The NEW SULLIVAN L-47

Wet, Blower or Dry Type
Standard Chuck ⅞" x 3¼"
Size Air Hose ¾"



Field reports for the past year have consistently indicated that the Sullivan L-47 rock drill has the drilling speed and power of the average 55-lb. drill. These same reports emphasize that holding qualities of the L-47 are comparable to the average 35-lb. drill.

The low maintenance cost of the L-47 has been proved again and again in actual service. Design and construction are similar to the Sullivan L-57, long the outstanding leader of the 55-lb. class.

EQUIPPED WITH THE

SULLIVAN MACHINERY COMPANY, MICHIGAN CITY, INDIANA

In Canada: Canadian Sullivan Machinery Company, Ltd., Dundas, Ontario

Manufacturers of: Hand Held Rock Drills • Wagon Drills • Drifters • Detachable Bits • Spaders • Paving Breakers • Plug Drills • Portable and Stationary Air Compressors • Utility Hoists • Contractors Hoists • Scraper Haulers • Loaders • Core Drills • Contract Core Drilling • Oil Well Drills • Coal Cutters

Branch Offices:
Birmingham, Boston, Butte, Chicago, Dallas, Denver, Duluth, El Paso, Huntington, Knoxville, New York, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Scranton
and in Principal Cities Throughout the World

NICKEL AIDS THE CONSTRUCTION INDUSTRY

to KEEP 'EM WORKING!

Engineers who design construction equipment can take pride in the construction industry's greatest achievement... its part in building America's "Arsenal of Democracy."

For they contributed to that amazing success, even long before the war started. They designed the tools with which the job was done... found ways to make equipment durable, and thus prevented many a breakdown of machinery at this critical time when nothing must interfere with the drive toward Victory.

Familiar to them, as a means of giving longer life to construction equipment, is the widespread use of Nickel Alloys. Those engineers have learned from long experience that Nickel imparts toughness, strength, and corrosion resistance to ferrous and non-ferrous metals, and thus assures improved performance under the most severe conditions.

Among them, as with men in many other industries, the saying is that "a little Nickel goes a long way" toward increasing dependability of machine parts—from gears to scraper blades, from dipper teeth to crusher rolls.

The experience of contractors, engineers, and machine operators in the field supports this conviction of the designing engineers... proves that the products of leading manufacturers stand up longer under the stress of exacting service.

It has been the privilege of INCO engineers and metallurgists to cooperate with the construction industry for many years. To men in all industries who desire assistance in the selection, abrication, and heat treatment of ferrous and non-ferrous alloys, the International Nickel Company cordially extends an offer of counsel and data.

New Catalog Index

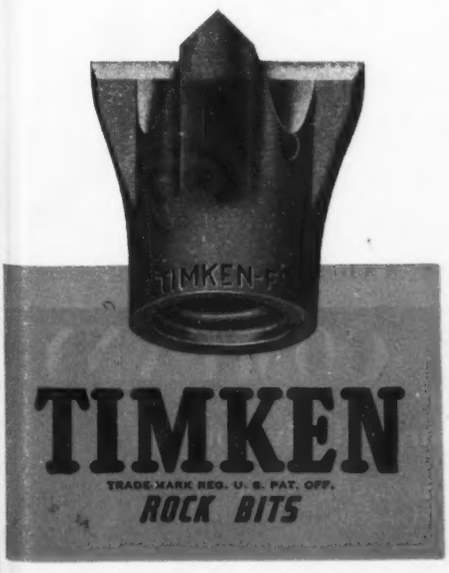
New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

* *Nickel* *

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*

WAR PARTS OF COPPER

DUG OUT OF THE EARTH WITH TIMKEN BITS



The Wolverine Tube Division of Calumet and Hecla Consolidated Copper Company is an extremely important producer of seamless copper and brass tubes. Wolverine's importance in the war is graphically illustrated by the group of miscellaneous copper parts shown here—all made from seamless tubes.

The copper for these parts is mined by the parent company, Calumet and Hecla. Timken Bits, used by the parent company permit the employment of older men, (5 years older on the average) because Timken Bits eliminate the need for packing large quantities of mine-sharpened steel. Moreover, Timken Bits have increased the time available for hoisting ore by approximately one hour per day on each of several working shafts. Result: more copper from Calumet and Hecla—more seamless tubes from Wolverine —more vital copper parts for war.

THE TIMKEN ROLLER BEARING COMPANY
CANTON, OHIO

I want samples that tell us where we're going!

This mill man is tough . . . he has to be. In his operation, guess-work and approximations won't do. For success depends on the ore recovery values—and on knowing in advance what they are. Hence he insists on true samples of the over-all run of tails, middlings and concentrates . . . and this man is talking our language! For many years, in large and small mills throughout the world, the GEARY-JENNINGS Sampler has been profitably adapted to the specific need and provided the workable routine. The machine is simple, rugged and scientific. Experience has proved that its principle is right.

The GEARY-JENNINGS Sampler

It cuts straight across the stream—moves out of the stream at each cut—and takes equal percentages of all parts. The interval is positive, but variable to suit the need. The mechanism is shielded from tampering or the intrusion of dust. Whether it is sampling wet or dry materials, it "takes the whole of the stream a part of the time."

Write for Bulletin 411. It fully describes the operation and the application to industry of the Geary-Jennings Sampler.

"THERE IS NO SUBSTITUTE FOR EXPERIENCE AND SERVICE"

THE GALIGHER COMPANY

ORE TESTING LABORATORIES

British Mining Supply Co. Ltd. (Pty.)
Johannesburg, So. Africa

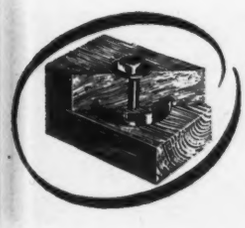
Established 1912

Metallurgical Division
13 South 2nd East Street
Salt Lake City, Utah

Structural Engineers and Architects — by the Thousands — are using these TECO SERVICES

Many leading companies and government agencies use Teco services. Upon request, Teco engineers have consulted with the engineers of the Army, Navy, and Maritime Commission, The Austin Company, Chas. T. Main, Inc., the Higgins Industries, Inc., and many others on the preparation of timber designs.

You, too, will find the Teco Consulting Service, Design Data Service, Typical Design Service and Research Service of great help in designing and building with timber. Teco distributors and fabricators in all parts of the country * can render helpful services, too. TIMBER ENGINEERING COMPANY—Washington — Chicago — Minneapolis —Portland.



* Firms and addresses supplied on request.

Timber Engineering Company,
1319 18th St., N. W., Washington 6, D. C.

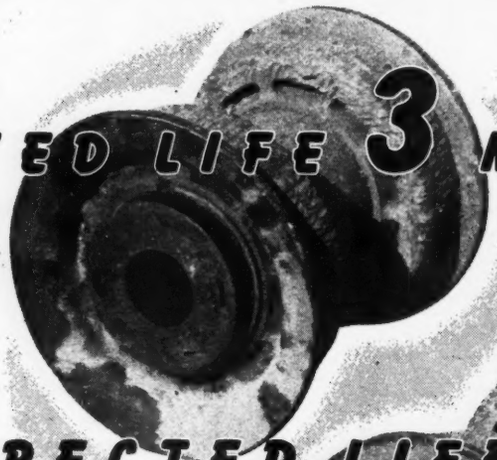
Please send me by return mail a Free copy of *"BUILDING for BATTLE—With the United States Navy."* The story in pictures of the Navy's spectacular use of lumber and timber during the Second World War.

Name.....

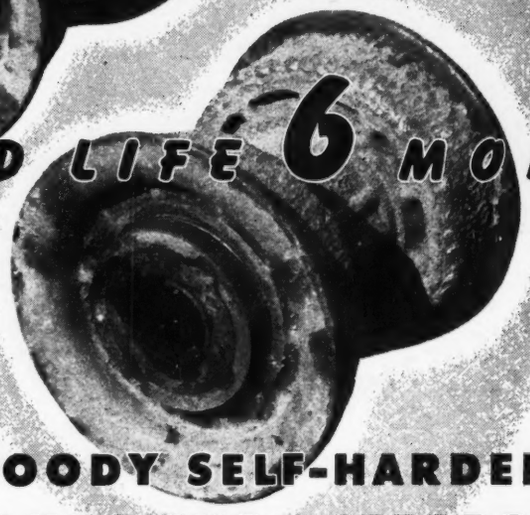
Firm Name.....

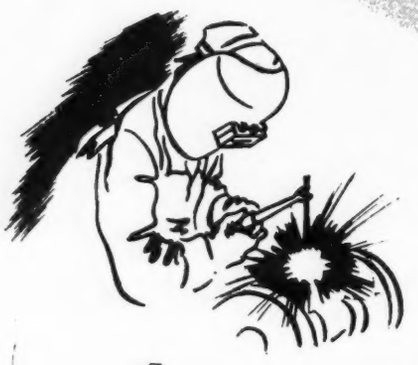
City..... State.....

EXPECTED LIFE 3 MONTHS



EXPECTED LIFE 6 MONTHS



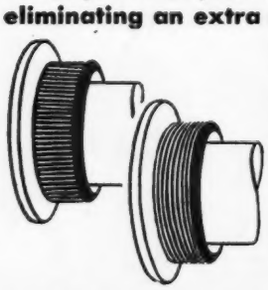


STOODY SELF-HARDENING MAKES THE DIFFERENCE!

ABOVE are two reclaimed rollers, taken from the same tractor, which are *identical in every way but one*. The upper roller was rebuilt to size with high carbon electrodes alone before being placed in service. The lower roller, also rebuilt in the same manner, carried an additional protective layer of Stoody Self-Hardening over the high carbon build-up*.

Abrasive conditions encountered in tractor operation were so severe the top roller was worn out in three months' time. The Stoody Self-Hardening, however, kept the lower roller in operation for another three-months period without attention—an increase in life of 100%!

Cost of the Stoody Self-Hardening deposit can be ignored in comparison to benefits obtained and the time saved in eliminating an extra overhaul.



Hard-facing can be applied either of two ways: (1) A bead run around the outer edge and space between the bead and collar filled in with horizontal welds or (2) A bead around the outer edge to bring the roller back to diameter, and intervening area between outer edge and collar filled with a continuous spiral of hard metal. Either method is equally successful but the latter has the advantage of more easily maintaining roller concentricity.

*The preliminary high carbon build-up can be eliminated if Stoody Self-Hardening is applied before excessive wear has occurred on the roller.

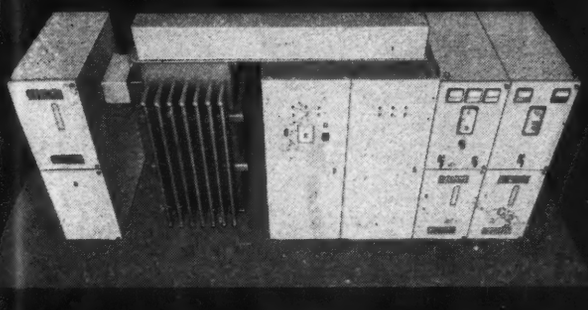
Have you received your copy of Stoody Specification Sheets? They illustrate and describe dozens of equipment-saving applications thru the use of hard-facing — sent free on request.

STOODY COMPANY
1140 WEST SLAUSON, WHITTIER, CALIFORNIA

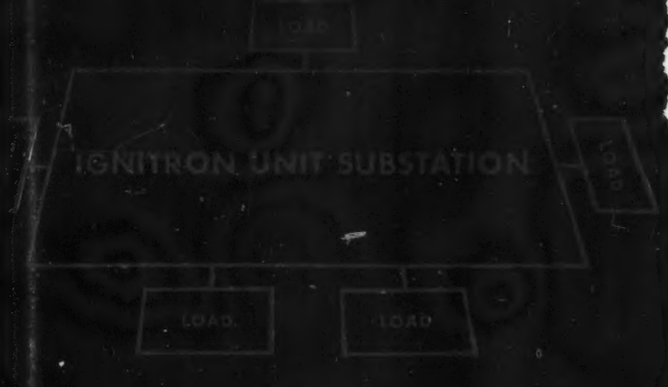
STOODY HARD-FACING ALLOYS
Stop wear . . . Eliminate Repair

new flexibility

to meet rapid changes in d-c power needs



Type "IUS" Ignitron Unit Substation



LIGHTWEIGHT, EASILY INSTALLED

Compact Ignitron substations can be located near the load centers, anywhere in your plant. No special foundations required—can be mounted on balconies if convenient.

When Ignitron Rectifiers are adopted for power conversion, your power supply takes on new flexibility and adaptability.

For example, a complete Ignitron Unit Substation can be easily shifted anywhere in the plant—and installed *near a new load center.* No special foundations are required. The compact, lightweight unit can be installed on any firm, level flooring.

Add to this the other outstanding advantages of Ignitron power conversion:

1. High efficiency over the entire load range—for peak loads, light loads, 24-hour loads.
2. The ability to operate unattended, with practically no maintenance.
3. Protected against dust and corrosive agents.

These are the reasons why Ignitrons are now serving war industry with more than 2,500,000 kw installed capacity. Investigate Ignitrons for your particular d-c power requirements. Your nearest Westinghouse office can give you full information. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pennsylvania.

In the mining industry

In addition to its inherent advantages of high efficiency, low operating costs and high overload capacity, the Ignitron Rectifier is ideally suited to mining service.

Small, compact Ignitron substations are particularly adaptable to wheel mounting. This permits the equipment to be moved readily to follow the load center.

For complete information about the Ignitron Rectifier, write Dept. 7-N for a copy of Book B-3024.

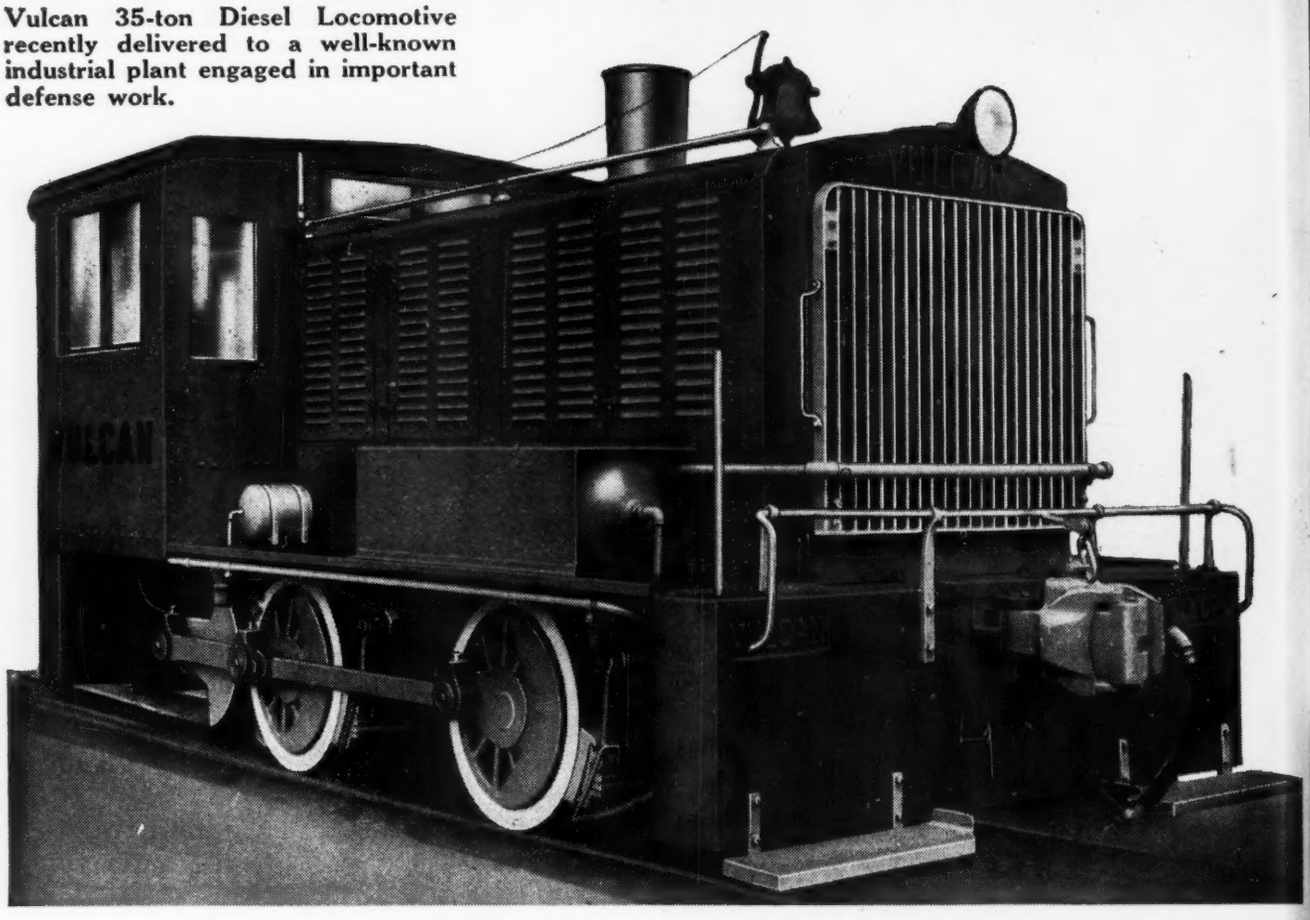
J-10255-3

Westinghouse *Electronics at Work*

IGNITRON RECTIFIERS

PLANTS IN 25 CITIES
OFFICES EVERYWHERE

Vulcan 35-ton Diesel Locomotive recently delivered to a well-known industrial plant engaged in important defense work.



It Won't Be Long --

before we'll be able to resume normal business and our present high production of steam, diesel and diesel-electric locomotives for army, navy and defense-plant requirements will leave us better equipped than ever before to serve industrial users. RIGHT NOW our engineers will be glad to figure on your present or future requirements and to give you the fullest-possible benefit of whatever priority rating you may be allowed by the War Production Board.

Remember that a Vulcan locomotive of any kind is always a quality product—built of the very best materials throughout and designed with an extra margin of working capacity that has made them universal favorites among all types of industrial users for more than 70 years. Details on request.

DIESEL AND GASOLINE LOCOMOTIVES
Constant-mesh, spur-geared transmission with separate final drive and reverse assembly. 6 to 35 tons

DIESEL-ELECTRIC LOCOMOTIVES
Most modern design and equipment throughout. 25 to 80 tons

STEAM LOCOMOTIVES
All industrial types and sizes

ROTARY KILNS, COOLERS AND DRYERS

ROTARY RETORTS, CALCINERS, ETC.

CRUSHING ROLLS, PULVERIZERS AND GRINDING MILLS

BRIQUETTING MACHINES,
Heavy-duty double-roll type

ELECTRIC HOISTS, CAGES, SKIPS, ETC.

CAST-STEEL SHEAVES AND GEARS

SHAKING-CHUTE AND CHAIN CONVEYORS

STEEL CASTINGS AND SPECIAL MACHINERY

VULCAN IRON WORKS ESTABLISHED 1849

VULCAN IRON WORKS

NEW YORK OFFICE
50 CHURCH STREET

WILKES-BARRE • PA.

DELAYS

--EVEN ON SHORT MOVES, whether working the face or on shipping cost money. Northwest differential Steering (fully controlled from the cab with the cab in any position) takes Northwests where other travel mechanisms have difficulty. Northwest crawlers travel with positive traction on both crawler sides at all times whether turning or going straight ahead. They make the tough traveling easier—another exclusive Northwest feature—ask about it.

NORTHWEST ENGINEERING COMPANY
1806 Steger Bldg., 28 E. Jackson Blvd.
Chicago 4, Illinois

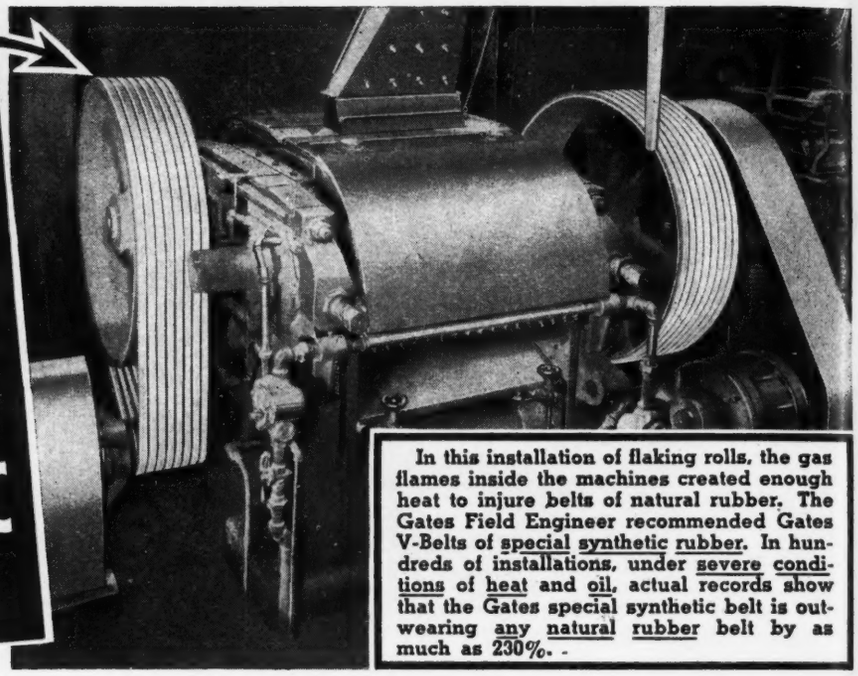
NORTHWEST

CONVERTIBLE FOR ANY MINING MATERIAL HANDLING OR EXCAVATION PROBLEM

NORTHWEST DRAGLINES are built in a range of sizes from 1/2 to 3 cu. yd. capacity

Here The Gates Field Engineer Recommended

GATES BELTS of Special SYNTHETIC RUBBER



In this installation of flaking rolls, the gas flames inside the machines created enough heat to injure belts of natural rubber. The Gates Field Engineer recommended Gates V-Belts of special synthetic rubber. In hundreds of installations, under severe conditions of heat and oil, actual records show that the Gates special synthetic belt is outwearing any natural rubber belt by as much as 230%.

He Can Tell You Whether You Need . . . .

❶ Synthetic Rubber V-Belts

❷ Steel Cable V-Belts

❸ Cotton Cord V-Belts

❹ Static-Safety V-Belts

❺ Rayon Cord V-Belts

Whenever a drive in your plant appears to be wearing belts out faster than it should—just pick up your phone and call the Gates Field Engineer.

He is a specialist in drive operation and he can quickly diagnose any trouble you are having. In most cases he can correct that trouble very easily and without recourse to using V-Belts of special structure.

There are, however, countless drives where V-Belts having special characteristics will prove to be the most efficient and economical that you can use.

The flaking rolls, pictured above, are a case in point. For more than five years now, Gates has been making special synthetic V-Belts—and the records in hundreds of applications show that, under severe conditions of heat and oil, these special synthetic belts are wearing 2 times to 2½ times as long as any belt of natural rubber.

There are other types of drives on which V-Belts with load-carrying members composed of flexible steel cables — or of rayon cords — will prove to be the most desirable application. Again, a Static-Safety V-Belt may best fit your special needs.

In any case, the wisest move you can make is to phone your Gates Field Engineer. Your telephone directory will give you his number. He will put all of his specialized knowledge and experience at your disposal—and he will always recommend the practice that will be most efficient and economical for you.

4312.

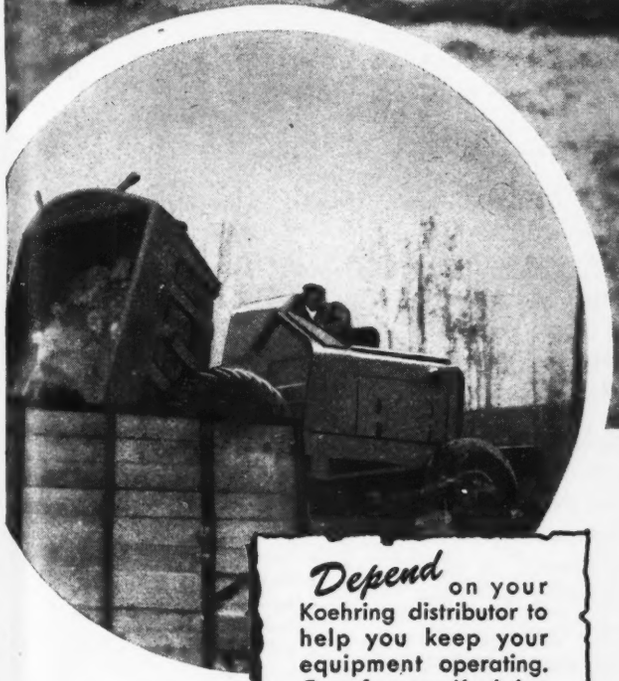
THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO, ILL. 549 West Washington
NEW YORK CITY 215-219 Fourth Avenue
ATLANTA, GA. 738 C & S National Bank Building
LOS ANGELES, CAL. 2240 East Washington Boulevard
DENVER, COLO. 999 South Broadway
DALLAS, TEXAS 2213 Griffin Street
PORTLAND, ORE. 333 N. W. 5th Avenue
SAN FRANCISCO, CAL. 1090 Bryant Street

Save Seconds Every Trip



DUMPTORS PROVIDE SPEED VITAL TO WAR CONSTRUCTION

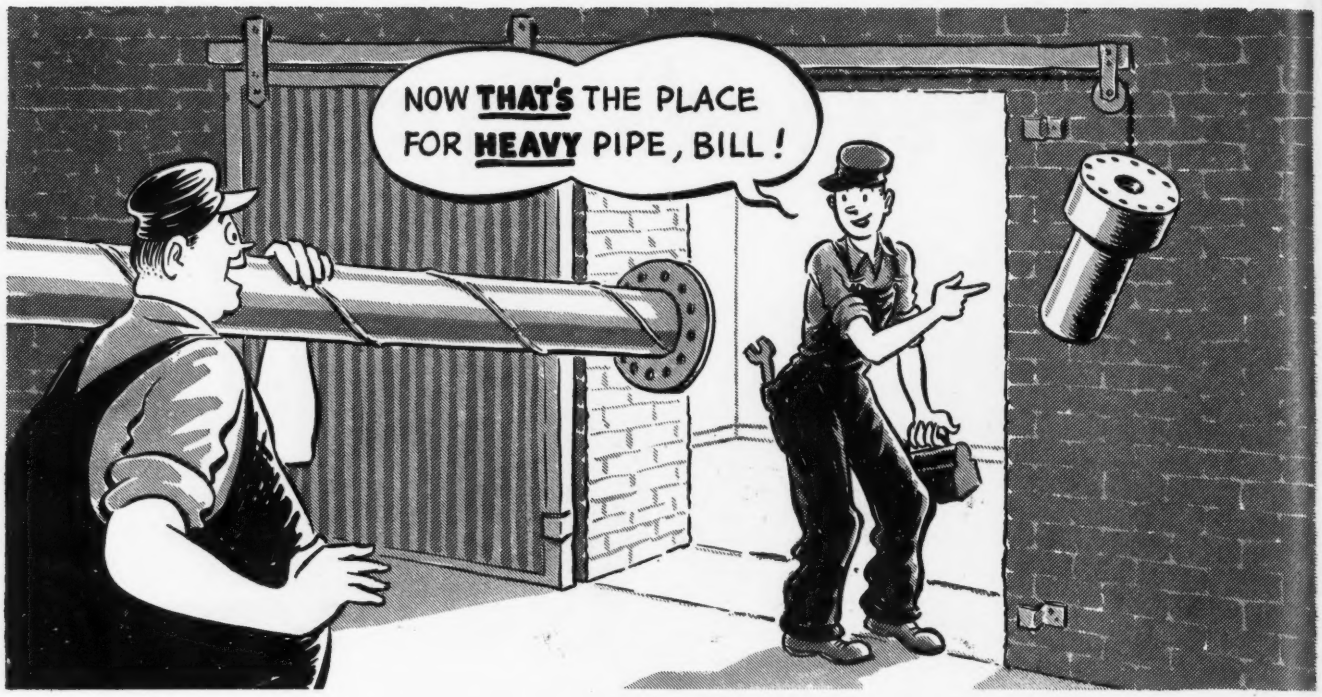
The operator merely trips the lever, and he's ready for another trip . . . that's how seconds are saved on every load. The Koehring Dumptor has no complicated mechanical body hoist arrangement . . . no delays . . . no hoist repair worries. The load is dumped exactly where you want it . . . when you want it . . . because it's simple and instantaneous. Traveling forward or reverse with three speeds either way helps keep lost time at a minimum.

KOEHRING COMPANY
Milwaukee, Wis.

Depend on your Koehring distributor to help you keep your equipment operating. Care for your Koehring equipment NOW, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT



Yes, there are lots of places for heavy pipe —but a lot more for Taylor Spiral

UNDERSTAND that we have no fight with heavy pipe. Fact is, we lean over backwards in the matter of pipe thickness and strength whenever extreme service conditions are present.

But just now we are talking about the ordinary run of services like those listed below. In most plants—possibly in yours—Standard Thickness Pipe is largely used for services of this class. Yet if you stop to figure clear through you will find that Standard Thickness is much heavier than is actually needed for these low or moderate pressure needs.

Those who have gone into this matter have found that light-but-strong Taylor Spiral Pipe can take over a large percentage of the jobs customarily assigned to Standard Thickness Pipe. Its spiral seam gives it greater strength in every direction than any other type of pipe of equal wall thickness—enables it to handle these services adequately, with strength and service life to spare.

In many applications the lighter weight of Taylor Spiral cuts installed cost to half that of the heavy pipe it replaces. In these times that means a lot: Not only saving of dollars; also conservation of vital steel.

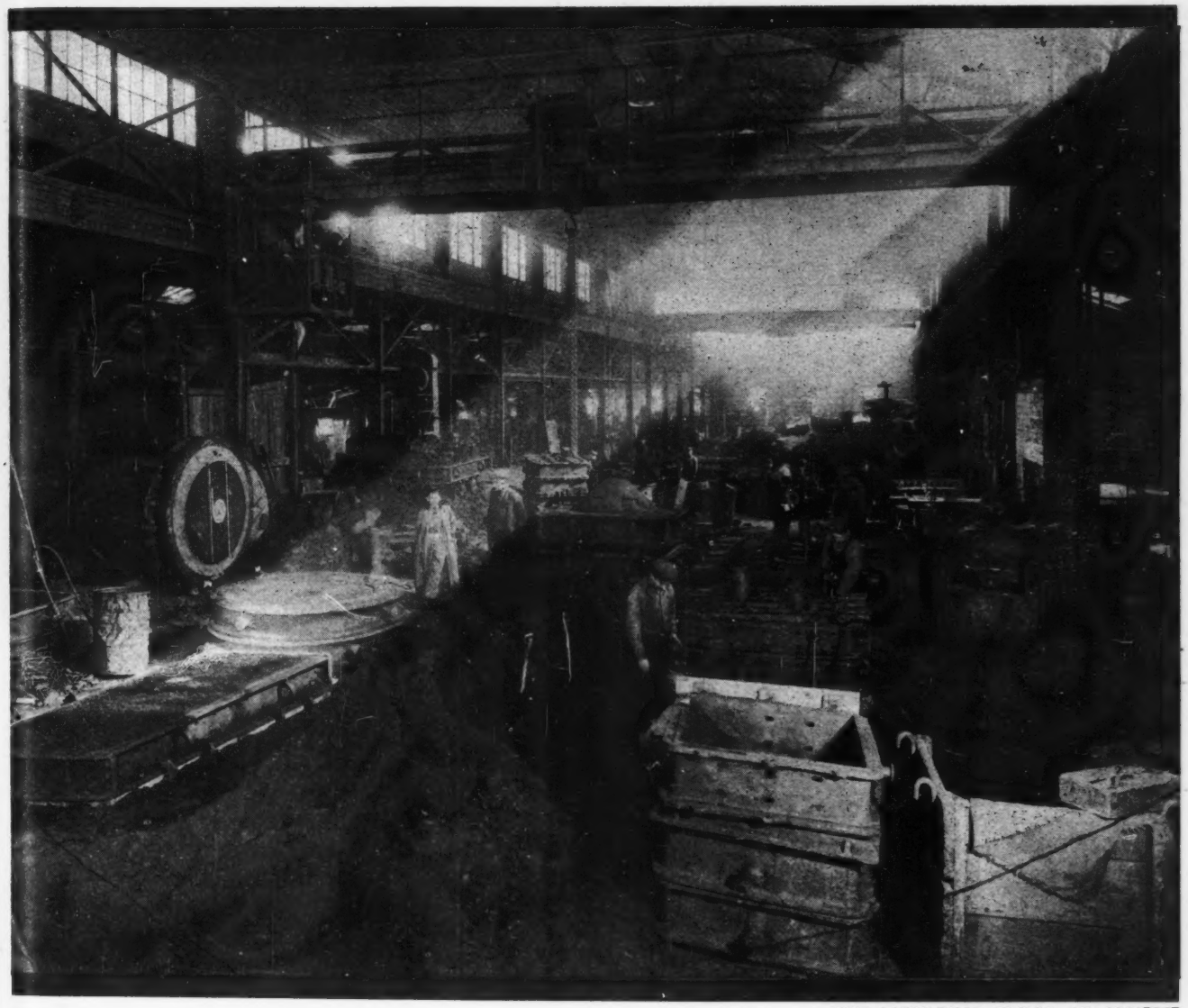
Changing to Taylor Spiral Pipe for services like those listed is made easy by the complete range of sizes and fittings. Thicknesses range from 18 to 6 gauge; sizes from 4" to 42"; joint lengths up to 40 ft. All types of end joints and couplings, all kinds of fittings and specials or fabricated assemblies, are produced by Taylor Forge, assuring a complete service and undivided responsibility.

Change to TAYLOR SPIRAL PIPE for:

- High and Low Pressure Water Lines.
- Low Pressure Steam and Air Lines.
- Steam and Diesel Exhaust Lines.
- Vacuum and Suction Lines.
- Blower Piping.
- Sand and Gravel Lines.
- Industrial Gas Lines.
- Oil and Gas Gathering Lines.
- Swing Pipe.
- Spray Pond Piping.
- Hydraulic Mining.
- Dredge Lines.

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P. O. Box 485
NEW YORK OFFICE: 50 CHURCH ST. • PHILADELPHIA OFFICE: BROAD ST. STATION BUILDING

TAYLOR *Spiral* PIPE



THE MOULDING FLOOR AT JOLIETTE

DESIGNED PRIMARILY FOR PRODUCING MANGANESE STEEL CASTINGS

▶ *Joliette Steel Limited produces castings of every description made of the various Carbon Steels, Manganese Steel, and other Alloy Steels, but it should be remembered that our Foundry was designed, many years ago, primarily to produce Wearing Parts made of Austenitic Manganese Steel for use in the Mining and in the Road Building Industries.*

▶ *Our Foundry was the first in Canada to have the major part of its production facilities devoted to the making of such Wearing Parts.*

▶ *The many years of experience which we have had in making Austenitic Manganese Steel Castings have given us a unique knowledge of the many problems involved in their production.*

▶ *Today these many years of experience enable us to produce Austenitic Manganese Steel Castings which will prove satisfactory under various predetermined service conditions.*

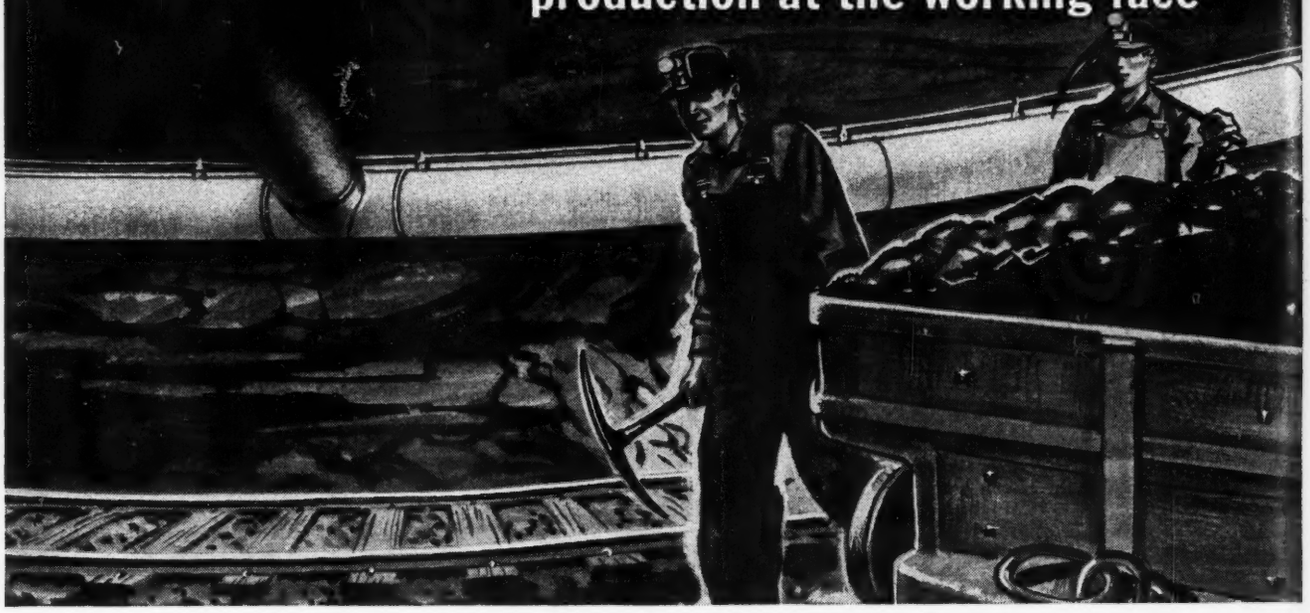
Please send communications about castings for export direct to our Plant at Joliette, Que., Canada.

JOLIETTE STEEL LIMITED, JOLIETTE, QUE.

Sales Offices: Montreal • Toronto • Sudbury • Winnipeg • Vancouver

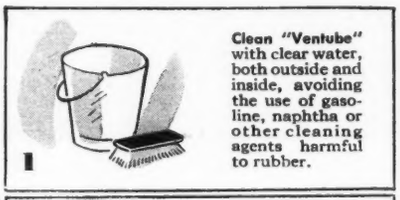
HOW TO USE DU PONT "VENTUBE"*

for greater efficiency and faster production at the working face

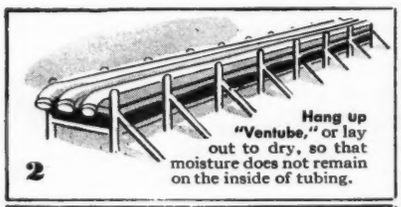


5 Important Points on Storing "Ventube" Between Jobs

You can make your "Ventube" system last far beyond expectations by checking these points on storing it between jobs . . . to preserve its outstanding strength, pliability and air conductance for long-time service.



1 **Clean "Ventube"** with clear water, both outside and inside, avoiding the use of gasoline, naphtha or other cleaning agents harmful to rubber.



2 **Hang up "Ventube,"** or lay out to dry, so that moisture does not remain on the inside of tubing.

3 **Lay "Ventube"** flat, smoothing out creases and wrinkles.

4 **Roll "Ventube"** into neat bundles, not too tightly to prevent air from reaching all areas of its surface.

5 **Store "Ventube"** in a cool, dry place, away from sunlight, heat and chance injury.

Properly installed, attached to a fan of adequate air capacity and with permissible motor, "Ventube" sweeps the working face with clean, cool fresh air. It quickly removes heat, dust and bad air from any space a man can enter—speeds work—promotes the health and steady efficiency of workers. "Ventube" is a valuable tool for ventilating ends, sinking shafts and winzes. It hastens caving, top-slicing and driving of drifts and crosscuts.

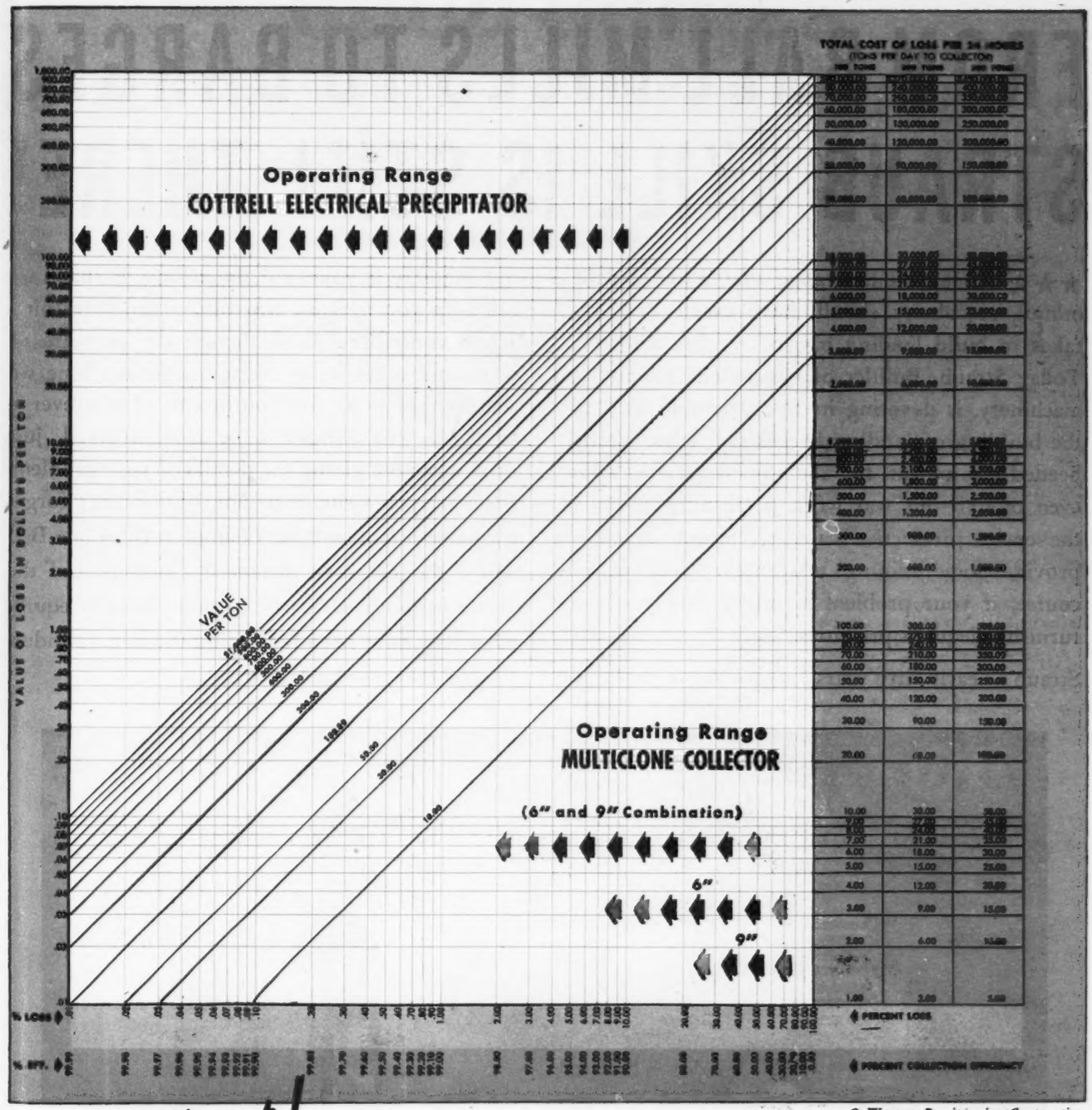
Unlike rigid tubing, "Ventube" is compact, flexible, easily handled and repaired—can be pushed back on itself quickly before blasting. Its sturdy, fabric construction, coated and impregnated with a special abrasion-resistant compound, enables "Ventube" to resist heat, moisture, mildew, dry-rot, fungus, acid and alkaline waters. If damaged by careless handling, "Ventube" can be patched as easily as an inner tube. E. I. du Pont de Nemours & Co. (Inc.), "Fabrikoid" Division, Fairfield, Connecticut.

*"VENTUBE" *is Du Pont's registered trade mark for its flexible rubberized ventilating duct.*

NOTE: For the duration of the War, "Ventube" can be supplied only to the extent that raw materials for its manufacture are made available in accord with regulations issued by the War Production Board. But if you have adequate priority, write *now* for complete information on this valuable tool of mechanized production.

DU PONT
REG. U.S. PAT. OFF.
VENTUBE
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



© Western Precipitation Corporation

Send for this chart!

THIS HELPFUL CHART—FREE

IF YOU HAVE A DUST RECOVERY PROBLEM—or are now using *any* type of dust collecting equipment—or are planning the installation of such equipment—send for a copy of this helpful new chart.

- It simplifies the comparison of dust recovery losses, enabling you to know *in actual dollars per day*, the exact collection losses in your plant at any recovery efficiency and for a wide range of dust values-per-ton.
- It permits you to make quick accurate comparisons of the operating costs of different collection efficiencies, guiding you in the selection of the most economical equipment for your particular requirements.

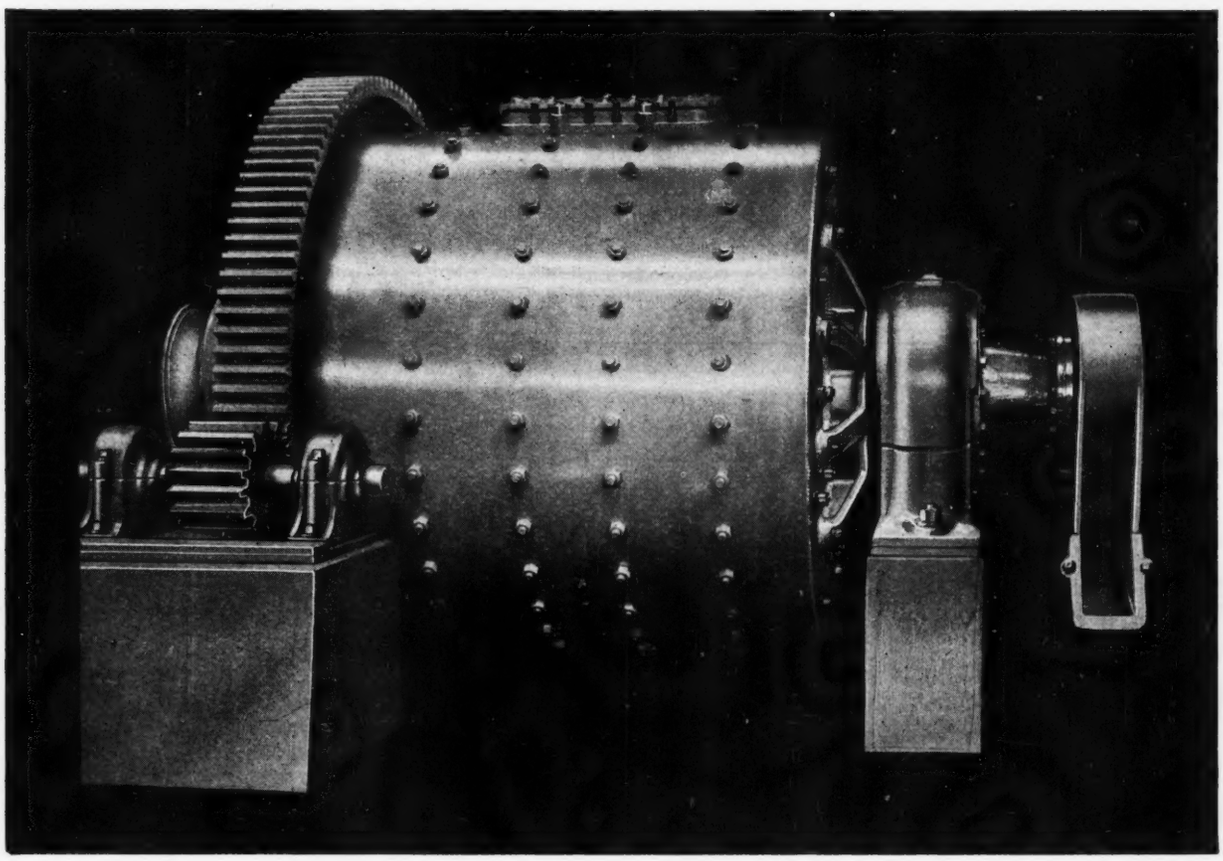
Copies of this helpful chart will be sent free as long as the supply lasts. *Write today!*

WESTERN
Precipitation
CORPORATION
ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS
Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 140 S. DEARBORN ST., CHICAGO 3
HOBART BUILDING • SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

FROM BALL MILLS TO BARGES STRAUB SKILL IS STILL THERE!

★★★ It may seem strange that a builder of mining machinery should have exactly what it takes to build landing barges . . . but it's true. Today Straub, Builder of Champions in mining machinery, is devoting its resources and skill to the building of landing barges and other vitally needed equipment for the armed services. But even though this war work is taking practically the entire productive capacity, Straub can still provide some mining machinery. That is, of course, if your problem is urgent and you can furnish adequate priorities.

Straub's nearly fifty years' experience in the mining industry is yours for the asking. Perhaps we can help you in some way other than furnishing actual equipment. Even though the pressure of war work takes much of our engineers time we shall be happy to give you benefit of whatever is available. No obligation or cost involved, just drop us a note giving the details of your problem. Whether you write us or not, please don't forget the name Straub and the Champion Rib Cone Ball Mills, the Kue-Ken Balanced Crushers and the dozen or more other cost cutting pieces of equipment they have been furnishing the mining industry for the past half century.



STRAUB MFG. CO.

506 Chestnut Street, Oakland, Calif.

Champion Rib Cone Mill—5 x 5 central discharge type. Note the large self aligning main journal bearings . . . the short shaft, close coupled pinion gear. Pinions are fitted with self aligning, SKF ball or roller bearings. These features save you money on installation . . . no need for highly skilled labor.

GOOD GUIDES

TO BETTER WIRE AND CABLE PERFORMANCE

- Send for the Hazard catalog—"Electrical Cables for Mining Use"
- Standardize upon as few sizes as possible.
- Expedite production by keeping your cable design simple.
- On problems of selection, call on your Hazard representative for assistance by writing, telephoning or telegraphing the nearest sales office.

- Store in a cool, uniform temperature location.
- Keep reels and coils off the ground. Continued exposure to moisture rots wooden heads and fibrous coverings.
- Protect cables from the weather.

- When cables get caught on obstructions, don't *pull* them loose. *Lift* them free.
- Don't let equipment roll over cables. This leads to broken or shorted wires.
- Keep gathering reels in proper working order to avoid run-overs, jams or jerks.
- To avoid overloading and overheating shovel cables, pull the full length off reels. Three layers of cable left on a reel will reduce the current rating by as much as 50%.
- Don't use your mining cables as tow ropes. Towing stretches the conductors, decreases capacity and pulls insulation loose.
- When shifting the location of a strip-mining operation, improvise a simple, semi-circular yoke instead of dragging the cable with a rope or chain hitch. The sharp bend resulting from the latter method may weaken cable and insulation at this point.
- Wipe portable cords and cables regularly so that they are free from grit, grease and chemicals.
- When splicing is necessary, use care in wrapping the joint, and for best results, vulcanize the repair.

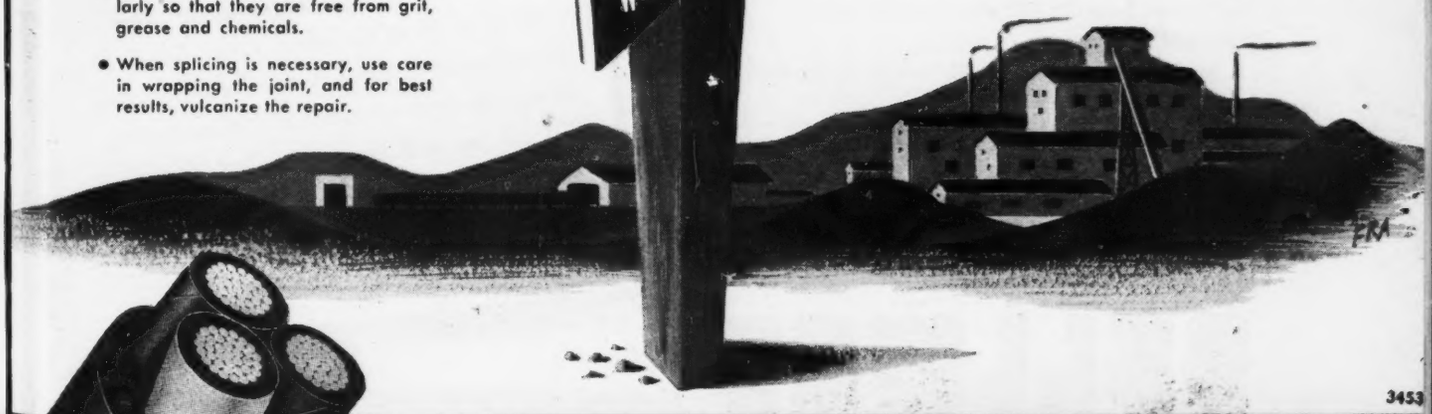
- Order as far in advance as possible, to allow time to apply for material allocations.
- Include proper preference rating, and C.M.P. authorization.
- When special power cables are ordered:
  - (a) supply us with cutting lengths promptly;
  - (b) include end use and conditions of installation.

- Don't run cords and cables over too-small diameter pulleys or drums. Use larger diameter pulleys.
- Locate cords and cables to minimize interference with normal traffic.
- Protect borehole power cables from damage or sabotage by concealed secondary supports.
- Shift cords and cables away from high-voltage equipment and sparking motors. The ozone generated will attack rubber.

- **Ask these offices for help**

Atlanta 3, Ga.	New Orleans 12, La.
Birmingham 3, Ala.	New York 17, N. Y.
Boston 16, Mass.	Philadelphia 3, Pa.
Buffalo 17, N. Y.	Pittsburgh 19, Pa.
Chicago 6, Ill.	San Francisco 4, Cal.
Cleveland 14, Ohio	Seattle 1, Wash.
Dallas 1, Texas	St. Louis 3, Mo.
Detroit 26, Mich.	Washington 4, D. C.
Los Angeles 21, Cal.	Wilkes-Barre, Pa.

HAZARD INSULATED WIRE WORKS
Division of The Okonite Company
Wilkes-Barre, Pa.



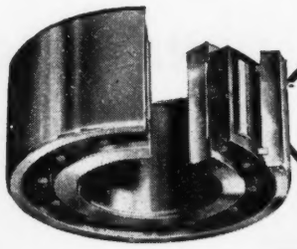
3453

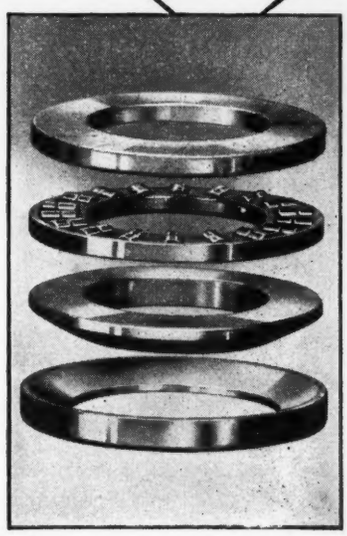
HAZARD

ARMY E NAVY

Insulated Wires and Cables for Every Mining Use

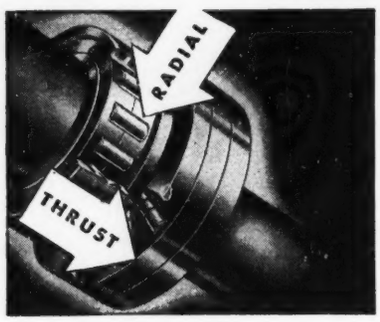
Maintenance *will be* DOUBLY IMPORTANT *after the war...*





Look into this RIGHT-ANGLE BEARING LOADING *now*...

The hours spent on maintenance, the production lost through repair shutdowns, bulk large in management thinking today. Tomorrow, when operating costs spell either competitive advantage or handicap, control of maintenance time and cost will be *doubly* important. That's why Rollway's Right-Angle Bearing Loading may be the decisive factor in your sales results.



No Compound Loads
No Oblique Loads

- **ALL thrust loads are carried at right angles to the roller axis.**
- **ALL radial loads are carried at right angles to the roller axis.**

Right-Angle Bearing Loading Cut Maintenance Time & Cost

When load magnitudes are large . . . when thrust forces are continuous, intermittent or reciprocal . . . Rollway's Right-Angle Bearing Loading definitely improves bearing life and reduces maintenance cost:

1. by splitting the load into its two simplest components of pure radial and pure thrust.
2. by carrying each of these components on separate bearing assemblies, thereby reducing the magnitude of load per bearing.
3. by eliminating all compound loads, all oblique loads and their resultants.
4. by using the full strength of a *complete roller assembly* to meet the stresses of thrust loads.

★ **DON'T WAIT** until the urgency of postwar reconversion and redesign are crowding you. Investigate Right-Angle Bearing Loading now. Send us sketches or drawings for free bearing analysis and recommendation today. Or ask for a Rollway catalog, showing hundreds of series in S.A.E., or American Standard metric dimensions and tolerances.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

Rx cut to a tolerance of ±.0005" at 68°F

When news of convoy crossings hit the headlines, few people recognize the immensity of the production job which preceded the event... and fewer know that in building the power plants of those ships one of the most exacting operations was the cutting of giant reduction gears.

The nine-foot diameter bull gears, that weigh 19,300 pounds must be cut to tolerances of five ten-thousandths of an inch. Such specifications demand the precision of watchmaking magnified a million times . . . and are the standards of workmanship and competency which characterize Hendy production skill.

Similar specialization in PRECISION is reflected in Hendy 4000, 6000 and 8500 horsepower turbines, 2500 and 2750 horsepower steam engines, and 300 KW turbo-generator plants . . . each of which is produced by straight line, mass production methods.

The reduction gear unit shown above is a part of complete marine turbine power plants produced by Hendy for the Maritime Commission. The Iron Men of Hendy also build Crocker-Wheeler generators and motors, and Pomona hydraulic pumps.

JOSHUA HENDY IRON WORKS

ESTABLISHED 1856

SUNNYVALE · CALIFORNIA

Divisions: POMONA PUMP COMPANY
CROCKER-WHEELER ELECTRIC MFG. CO.

Manufacturing Plants: SUNNYVALE, LONG BEACH, POMONA and TORRANCE in CALIFORNIA • AMPERE, N. J. • ST. LOUIS, MO.
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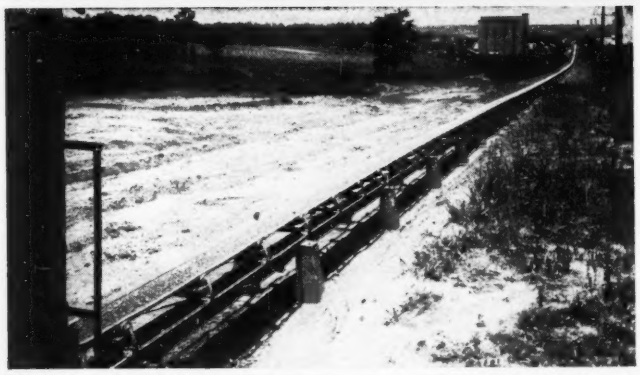
Another OUTSTANDING JOB by CONTINENTAL



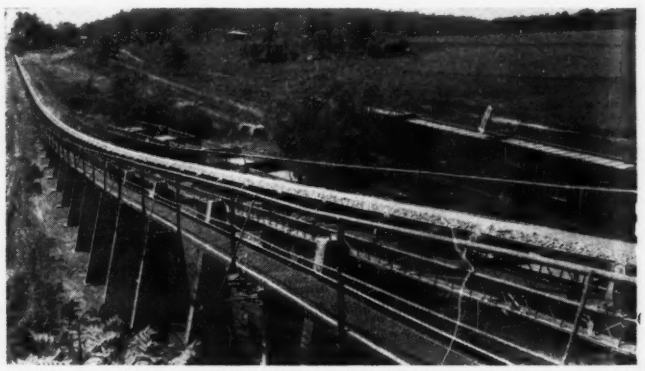
Our Belt Conveyor Engineering Data Book, ID-105 is just off the press. Contains complete information on Belt Conveyors.

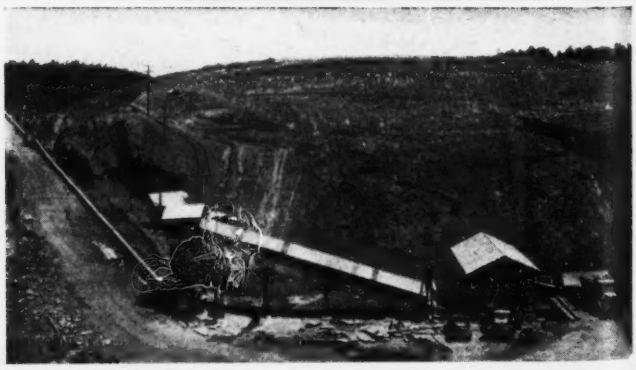
Write for a copy today.

National Cement Company, Ragland, Alabama, opening a new quarry, was confronted with the problem of handling crushed stone one and one-quarter miles from quarry to mill stock pile. After considering all methods of haulage, the management, in conjunction with Continental engineers, designed a Belt Conveyor System giving a cost per ton for handling considerably under any other system considered.

The complete Conveying System is made up of seven Main Conveyors, the overall centers of each based on the topography, but all using the same size motors and drives for interchangeability. Continental equipment is used throughout. The proven low cost (less than 1c per ton) for handling this material has fully justified the management's decision to move their crushed stone via Continental Belt Conveyors.

We are proud of Continental's part in designing this equipment to move stone at a minimum cost per ton, low maintenance and a minimum of labor.





INDUSTRIAL DIVISION

CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

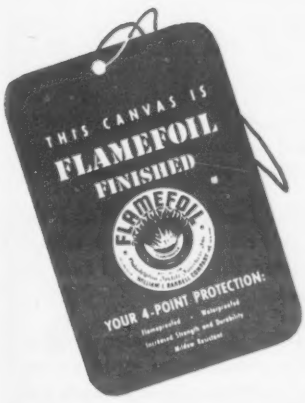
CGC ATLANTA • DALLAS • MEMPHIS CGC

FLAMEFOIL FINISHED CANVAS

Insures You Against Fire Hazard!

FIRE

Are you a buyer of canvas or canvas products? If you are, read this message carefully. ★ Canvas burns . . . just like paper. Many of the great fires of history were caused by matches, cigarettes, or cinders coming in contact with canvas. ★ Flamefoil Finish makes canvas flameproof. A lit cigarette or match coming in contact with Flamefoil Finished canvas may cause a char in the fire area . . . it cannot cause a blaze. Even a blow-torch cannot make it flame! ★ Flamefoil Finish, a triumph of modern chemistry, offers this 4-point canvas protection: Makes canvas flameproof • Makes canvas waterproof • Resists ravages of mildew, mold, and other bacteria causing canvas rot • Increases canvas tensile strength. ★ For your own safety . . . demand Flamefoil Finish when buying canvas or canvas products. It's your insurance.



Write to canvas dealer nearest you for names of manufacturers making the Flamefoil Finished canvas products you need.

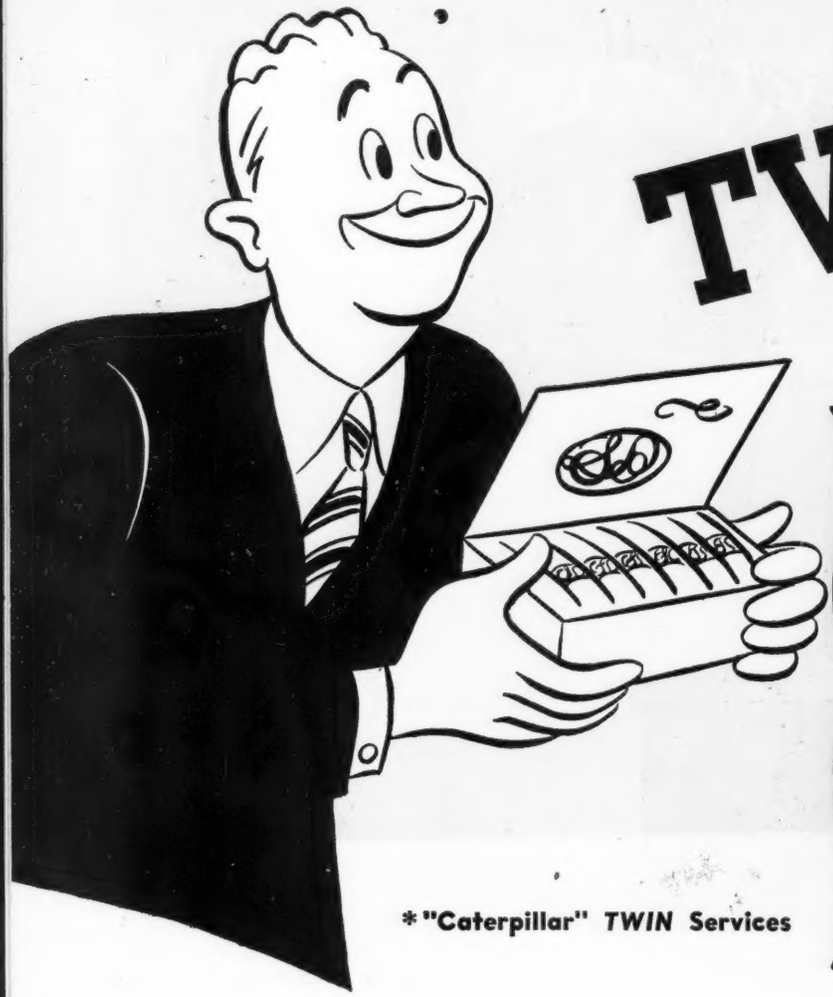
Manufactured by PHILADELPHIA TEXTILE FINISHERS CO., Inc.

WILLIAM L. BARRELL COMPANY, INC.

SELLING AGENTS

40 WORTH STREET, NEW YORK, N. Y.

Mister, you're mighty lucky to have those TWINS*



*"Caterpillar" *TWIN* Services

AND we are justifiably proud to be their Papa! They'll serve you well with a minimum of care and cost. We saw to that in the beginning.

TWIN Number One is called "Factory Built-in Service." His very important brother is "Dealer Quality Service." Together, they bring vigorous, dependable, year-round PERFORMANCE from your "Caterpillar" Diesel equipment.

For example, Number One represents "Caterpillar's" basic engineering skill and precision workmanship which have given you

(a) *Simplicity of operation.*
(b) *The ability to work in any climate, on any job.*
(c) *The ability to burn a wide variety of fuels.*
(d) *Proved—again and again—dependability.*

Number Two—"Dealer Quality Service"—offers you

(a) *Factory-trained service men.*
(b) *Modern shops.*
(c) *Special tools.*
(d) *Money and metal saving repair methods.*

This particular "TWIN" is vitally essential to you right now. Make it a point to see him regularly!

There is scarcely a "Caterpillar" Diesel Tractor, Motor Grader, Engine or Electric Set—regardless of age or usage—that hasn't a lot of dependable working hours left in it. "Dealer Quality Service" will help you keep it on the job.

REMEMBER

THE FIGHTING FOUR

INSPECT. Look your equipment over frequently. For expert "internal" inspection, call in a trained "Caterpillar" Service Man. Read your Operator's Instruction Book.

LUBRICATE. Use the right oil at the right time in the right place and in the right quantity. Keep it clean and replace before it deteriorates.

ADJUST. Tighten all bolts. Keep valves and clutch in proper adjustment. Read the Operator's Instruction Book.

REPLACE. Have "Dealer Quality Service" recondition or replace worn bearings, cylinder liners, clutch linings and other parts vital to restored power and extended engine life.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

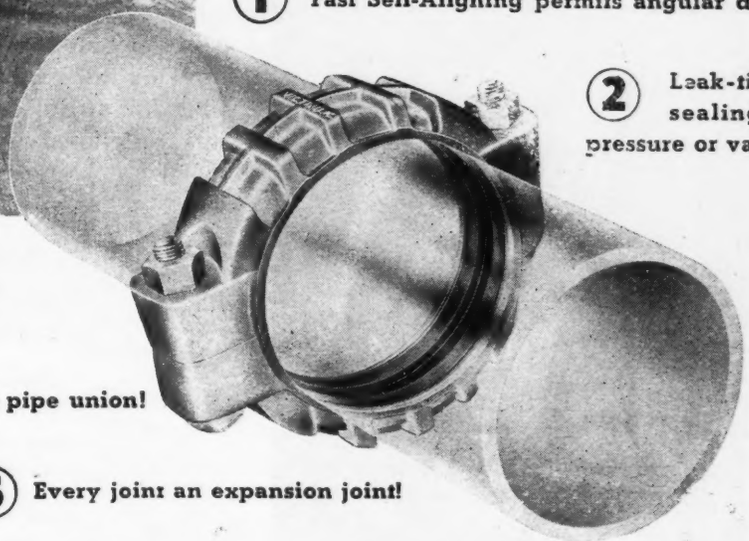
TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

A PIPELINE THAT WON'T STAY BOMBED OUT!

It bends with the blast of near misses as illustrated in the training picture you see here. At the battle front when sections are destroyed by direct hits or by big bombs hitting nearby, new pipe can be laid and coupled in a matter of minutes. The reason? The couplings of thousands of miles of the Blitz pipelines, that are helping make rapid troop advances possible, *are Victaulic.* Add up the 5 basic Victaulic advantages and you'll see why the Victaulic method of coupling pipe is not only faster but better at home, too.

(1) Fast Self-Aligning permits angular deflection!

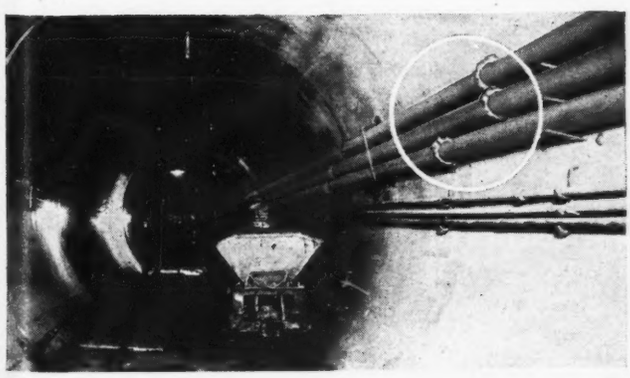
(2) Leak-tight, self-sealing under pressure or vacuum!



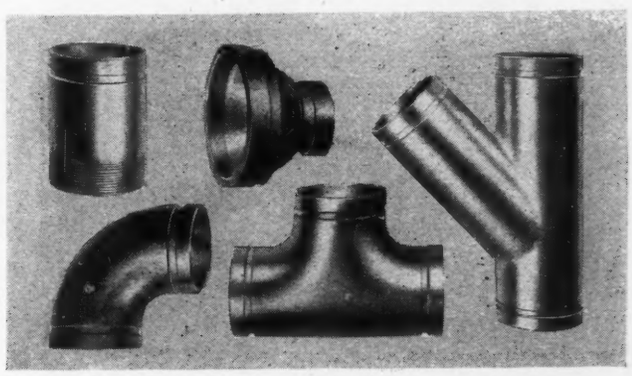
(3) Positive mechanical lock of pipe lengths!

(4) Every joint is a pipe union!

(5) Every joint an expansion joint!



BENT PIPE IS LARGELY ELIMINATED! Proved in hundreds of America's great mines! Installed quickly, inexpensively by unskilled labor. Only tool needed a small wrench. Maintenance is nil . . . salvage value is 100%. Angular flexibility allows pipe to snake through irregular passages without bending of pipe or interfering with trackage.



VICTAULIC FULL-FLOW FITTINGS eliminate the tedious work of ordinary pipe fitting. Long easy sweeps and smooth true-circular walls reduce friction losses. A real contribution to speed and ease of installation and greater efficiency in conducting fluids and gases in pipe systems!

BUY MORE WAR BONDS !

MINE

VICTAULIC

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

Copyright 1943 by Victaulic Co. of America

Now on the presses . . . a new easy-to-use Victaulic Catalog and Engineering Manual. If you haven't already reserved your copy, do so now.

Name _____

Firm _____

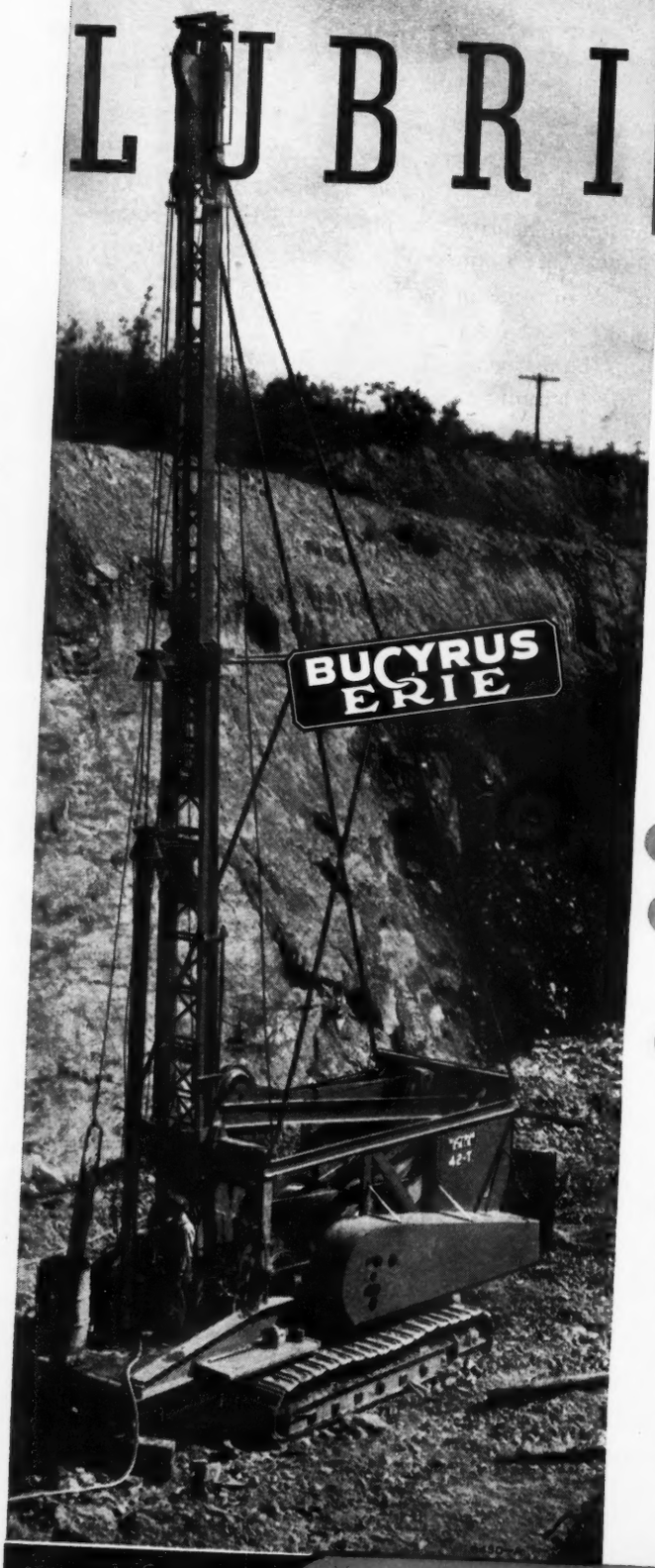
Address _____

Mail to nearest address: VICTAULIC COMPANY OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y.; Victaulic Inc., 727 West 7th St., Los Angeles 14, California; Victaulic Co. of Canada, Ltd., 200 Bay St., Toronto. 3-B

Your Blast Hole Drill Needs

LUBRICATION

to last the duration!



You can do much to help your blast-hole drill endure the war years — while it's working its hardest and best — by lubricating it regularly. Be sure to follow carefully the complete lubrication instructions of your drill manufacturer, and you'll be well on your way to drilling as Uncle Sam likes it — at top speed for the duration.

Here Are Some Points to Watch:

1. Bearings on crown sheave and sand line sheave should be lubricated once each shift.
2. On modern machines lubricate ball or roller bearings on jackshaft and engine pulley shaft with small amounts about once each week. Don't use graphite grease. On older machines with plain bearings, lubricate daily.
3. If your machine is caterpillar-mounted, lubricate crawler fittings once each week, oftener when machine is propelling long distances. Even when your drill is not travelling, keep cats lubricated against wearing motion developed in drilling.
4. Keep wire lines lubricated with wire rope lubricant to prolong their life.
5. Be sure to lubricate spudding pinion and bull reel pinion once each shift.
6. Don't overlook sand reel shaft bearings and operating lever connections — they should be lubricated once each shift.
7. Get complete lubrication instructions from your drill manufacturer and follow them carefully.

Keep 'em Drilling

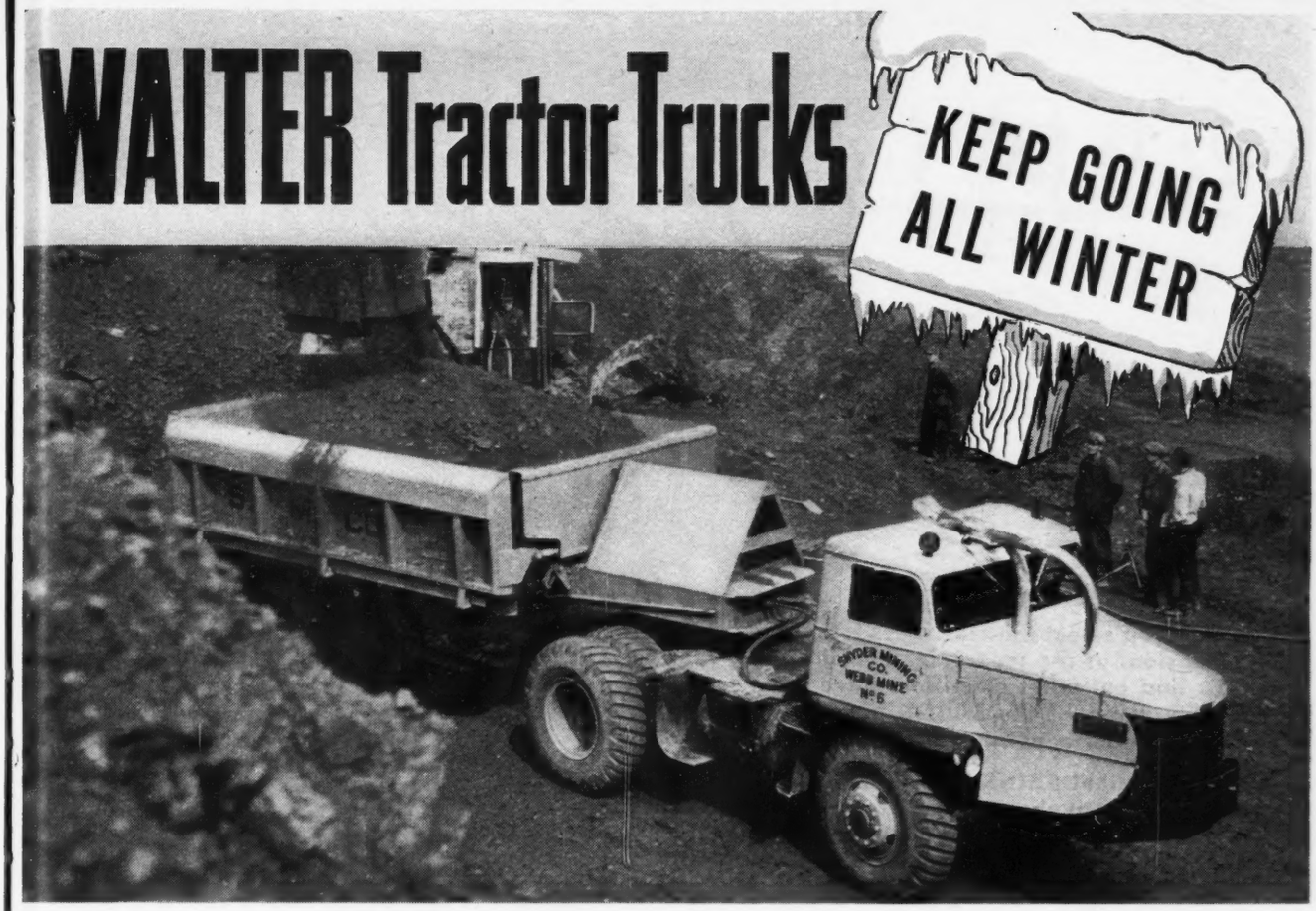
H-46

ARMY E NAVY

Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

WALTER Tractor Trucks



There is no off-season for Walter Tractor Trucks. At some mines, they are hauling huge loads of overburden under punishing off-the-road conditions once thought impossible for giant trucks with 18-20 yd. semi-trailers. At other mines, where plant operations permit, they are hauling big ore loads in spite of snow, mud and slippery surfaces.

To make this hauling possible, the exclusive Walter Four Point Positive Drive converts the 300 H.P. motor's torque into 100% traction. Wheel slippage is prevented by three patented Automatic Locking Differentials that proportion the power to the FOUR driving wheels according to the traction of each wheel at any instant.

Specially designed for off-the-road work, Walter Tractor Trucks also incorporate the following features: Tractor Type Transmission, Suspended Double Reduction Drive, Scientifically Distributed Weight, Short Wheelbase, Hydraulic Steering and Air Brakes. Write today for the detailed story of how you can increase your tonnage with Walter Tractor Trucks.

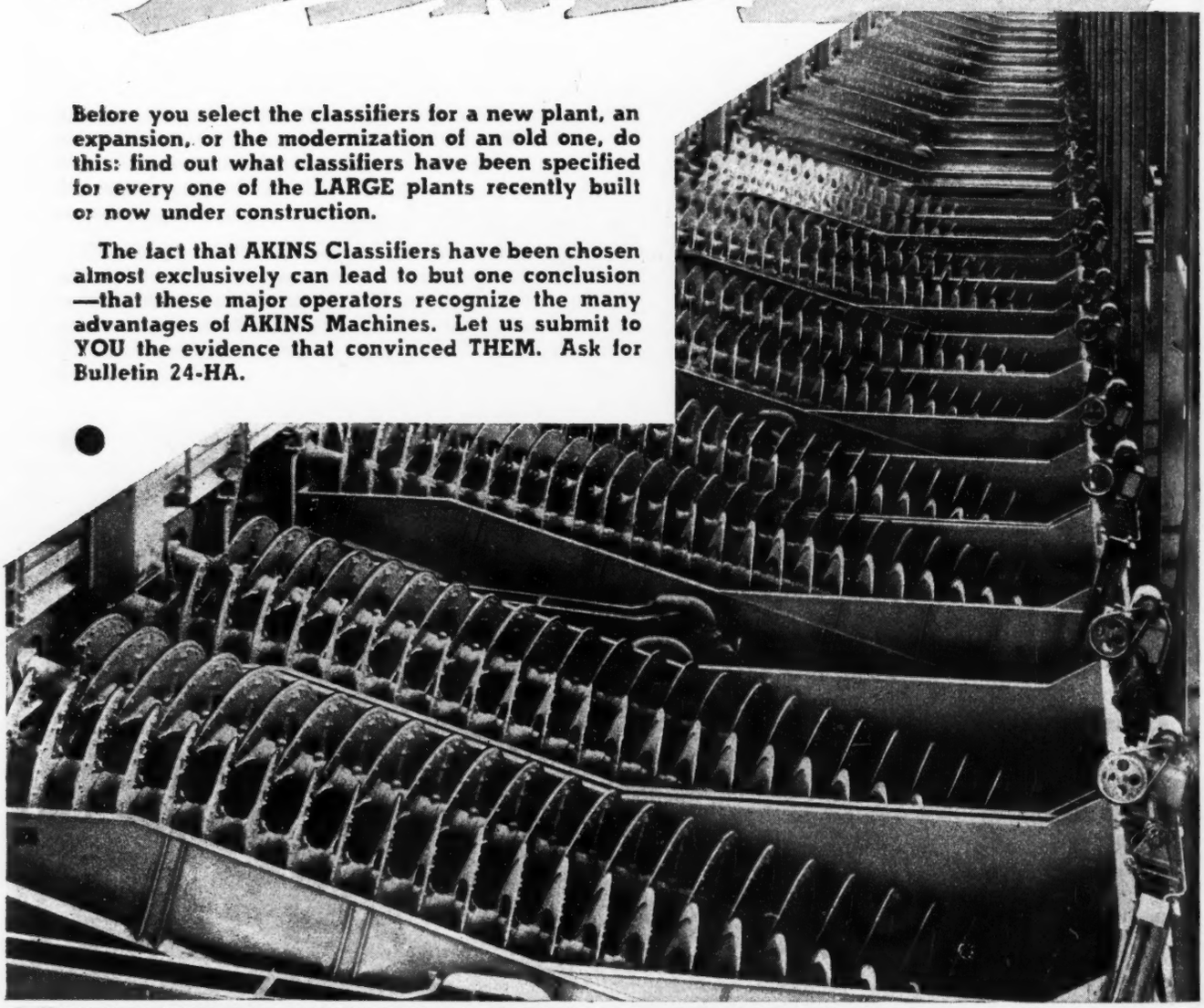
WALTER MOTOR TRUCK CO., 1001-19 Irving Avenue
Ridgewood 27, Queens, L. I., N. Y.

WALTER
TRACTOR TRUCKS

AKINS Classifiers are RIGHT DOWN YOUR ALLEY, TOO

Before you select the classifiers for a new plant, an expansion, or the modernization of an old one, do this: find out what classifiers have been specified for every one of the LARGE plants recently built or now under construction.

The fact that AKINS Classifiers have been chosen almost exclusively can lead to but one conclusion —that these major operators recognize the many advantages of AKINS Machines. Let us submit to YOU the evidence that convinced THEM. Ask for Bulletin 24-HA.



COLORADO IRON WORKS CO.

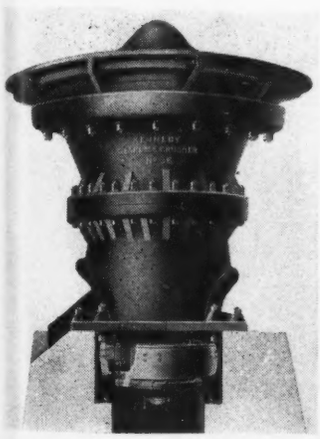
MAIN OFFICE DENVER, COLORADO, U.S.A.

CANADIAN LOCOMOTIVE CO., LTD., KINGSTON, ONT., CAN.
VANCOUVER IRON WORKS, LTD., VANCOUVER, B. C., CAN.
HEAD, WRIGHTSON & CO., LTD., STOCKTON ON TEES, ENGLAND
HEAD, WRIGHTSON & CO., (SO. AFRICA) LTD. JOHANNESBURG
THE CLYDE ENGINEERING CO., LTD., GRANVILLE, N.S.W.

Why operators buy "KVS" CRUSHERS

"BECAUSE IN ADDITION TO THEIR GREAT CRUSHING ABILITY—

We Save Power!"



Ball Bearing Gearless Short Shaft Standard Crusher with synchronous motor built-in pulley.

• Kennedy Ball-Bearing Gearless Gyratory Crushers save power because the power is applied *direct* to the crushing point. A large pulley running on ball bearings acts like a flywheel. There's no power *wasted* —and that's just *one* reason why, size for size, "KVS" Crushers will crush *more* than any geared crusher made—and do it for less operating cost and less cost of maintenance and repairs. Built in a wide range of sizes and capacities for both primary and secondary crushing. Look over the entire five "KVS" reasons given here—then write for Catalog —always remembering

HERE ARE THE FIVE "KVS" REASONS

POWER SAVING No power wasted. All power applied directly to crushing.

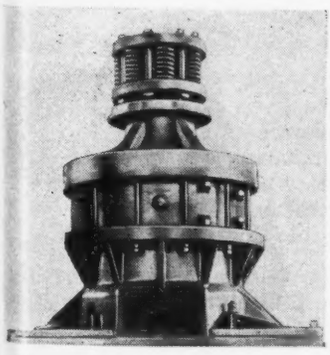
CAPACITY Size for size, will crush more than any geared crusher now made.

EASY MAINTENANCE Entire crusher interior easily accessible.

LOW REPAIR COST Reversible concaves prolong life of this vital wearing part.

Forced feed lubrication makes for low cost operation.

EFFICIENCY
Quick, simple adjustment of crusher opening. Suspension of shaft on spring release head protects against tramp iron. Only crusher built with spring release that enables crushing on solid anvil—concave.



Ball Bearing Gearless Type Low-Head Crusher for fine crushing.

• YOU GET BETTER, LOWER-COST CRUSHING WITH

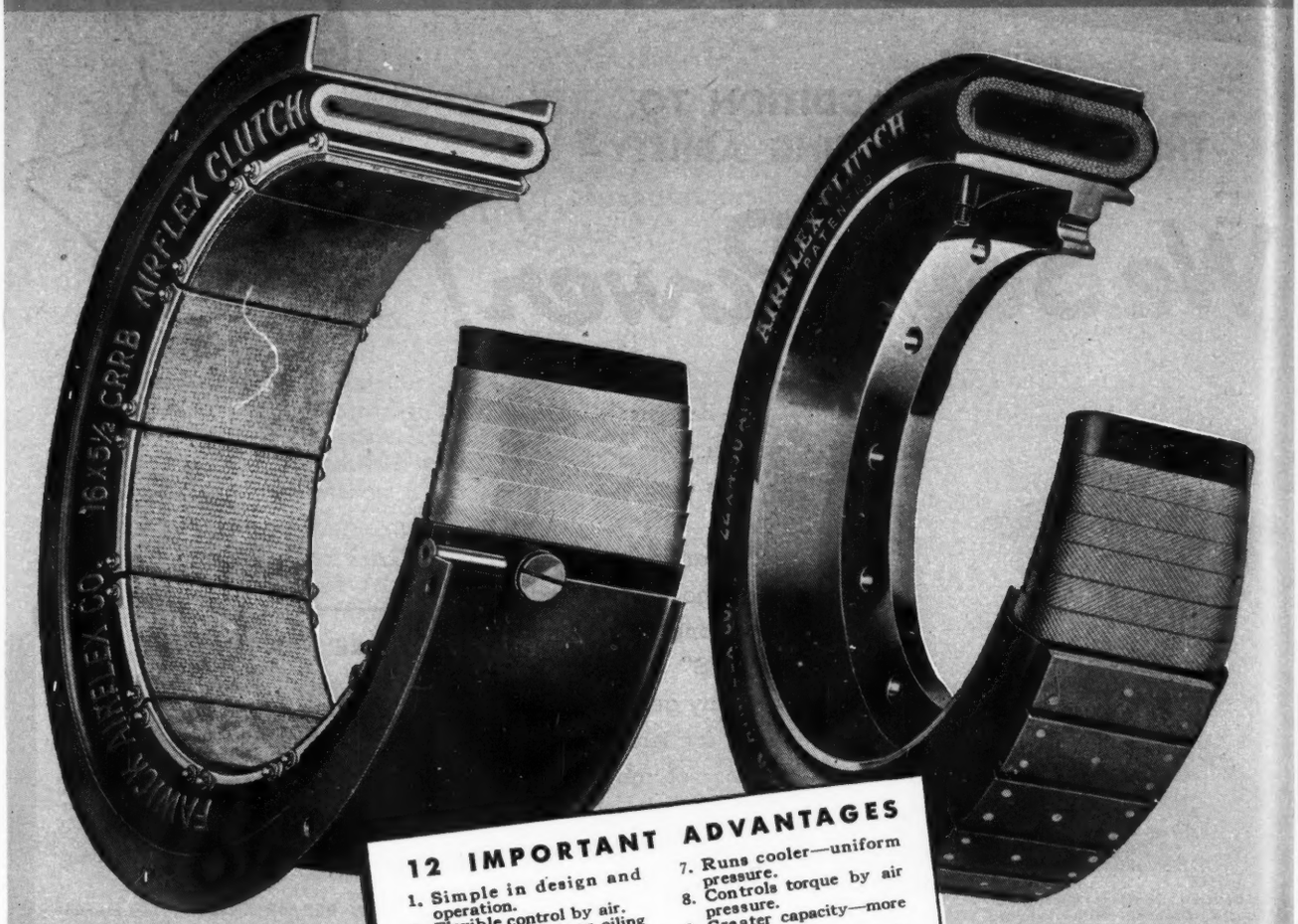
KENNEDY-VAN SAUN — BALL-BEARING GEARLESS GYRATORY CRUSHERS

• We have a very large line of mining, crushing, cement, lime burning, and pulverized coal equipment. If interested write for special bulletin.

KENNEDY-VAN SAUN MFG. & ENG. CORPORATION
Representatives in All Principal Cities of the United States
2 PARK AVENUE, NEW YORK, N.Y.
FACTORY, DANVILLE, PA.

THE CLUTCH THAT CANNOT FAIL—

built for Heavy Duty service



EXTERNAL CONSTRICTING TYPE

INTERNAL EXPANDING TYPE

12 IMPORTANT ADVANTAGES

1. Simple in design and operation.
2. Flexible control by air.
3. No adjustments or oiling—low maintenance.
4. Dampens vibration—absorbs shocks.
5. Corrects misalignment automatically.
6. Smooth starting—no jerks.
7. Runs cooler—uniform pressure.
8. Controls torque by air pressure.
9. Greater capacity—more compact.
10. Remote control by air valve.
11. Replaces couplings.
12. Acts as clutch, slip-clutch or brake.

A new principle—control of power and torque by air—makes it possible for the Fawick Airflex Clutch to perform under conditions that other types of clutches cannot handle.

With the Fawick Clutch, there is no vibration—shocks are absorbed by a cushion of air. No levers or toggles—no adjustments to make—no lubrication needed. Maintenance is very low—operation very economical.

If your product needs a heavy-duty Clutch, Brake, Slip Clutch or Flexible Coupling, write us for recommendations.

FAWICK AIRFLEX COMPANY, INC. **9919 Clinton Rd.** **Cleveland 11, Ohio**

In Britain, Crofts Engineers, Ltd., Bradford, England

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

GETTING A "FIX" ON THE FUTURE

WE'RE getting a "fix" on the future by setting our sights on today's horizons.

In recent years practically every branch of industry has witnessed vast technological changes, many of which have been greatly accelerated by war's unrelenting demands. New vistas have opened—new processes been devised—new products developed. And it has been our privilege to cooperate in the application of Carborundum Brand Super-Refractories to many of the furnaces utilized in conjunction with these processes.

Without interrupting our efforts in filling the refractory requirements of war industries, we find time to discuss plans for the future because we know that tomorrow's problems must be solved today. They cannot be put off until tomorrow for tomorrow would be too late.

Being fully cognizant of this fact many laboratories — many pilot plants—are already working on new and improved materials and equipment for the post-war period. In some of this work refractory problems will undoubtedly arise in the solution of which we would like to lend a hand.

The same technical aid extended to other furnace operators is likewise available to you. Write us today instead of waiting until tomorrow.

CARBORUNDUM

THE CARBORUNDUM COMPANY • **PERTH AMBOY, N. J.**

REG. U. S. PAT. OFF.

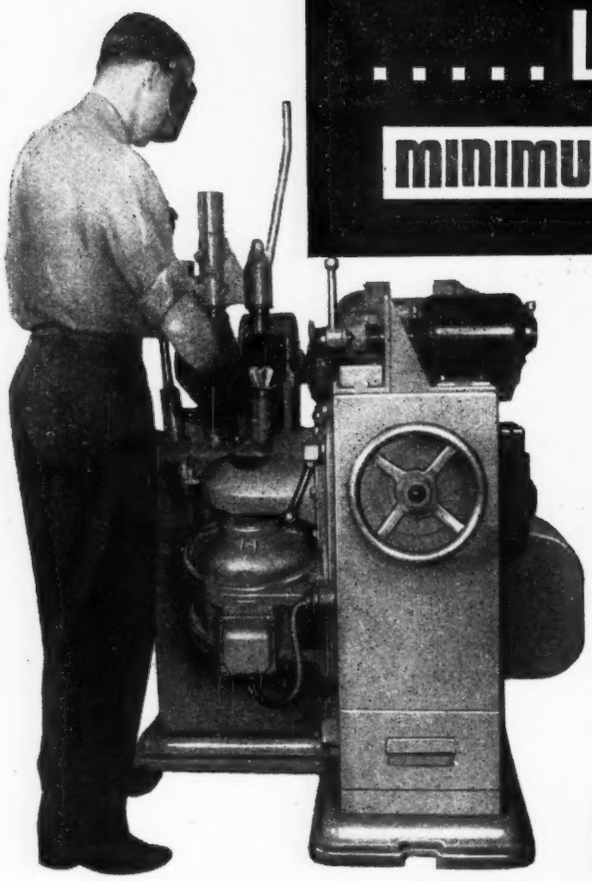
Refractory Division

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

MORE DRILLING FOOTAGE ..... LONGER BIT USAGE

MINIMUM RECONDITIONING COST



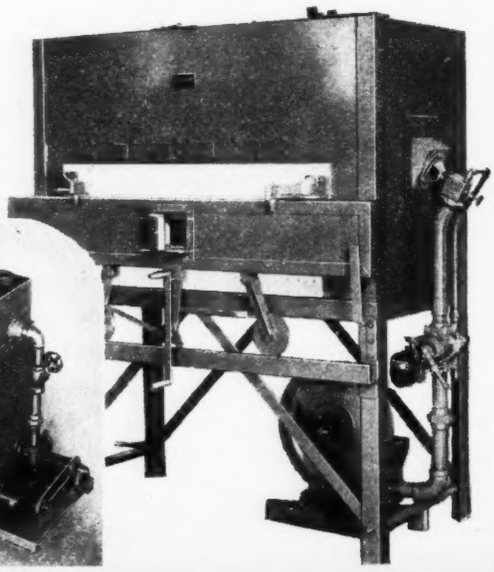
MASSCO-McCARTHY HOT MILLER (Left)—Redresses removable rock bits at forging temperatures. Removes scale of decarbonization exposing unchanged steel for correct hardening. Uniform flute and gauge; no crowning effect or bit distortion at maximum capacity. Gauge taper adjustable. Increases bit usage. No compressed air needed. . . . Many advantageous features not embodied in any other hot miller. Field tested four years.

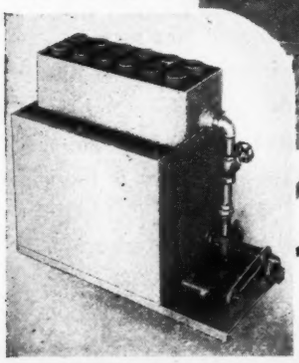
MASSCO Model 38 ROCK BIT GRINDER (Below)—Resharpens all makes of removable rock bits. Coolant applied above and below prevents burning cutting edge. Rotatable gauge grinding head grinds all clearance angles with plain face wheel. 100 hits per hour. (Reasonable operation of Hot Miller, above, better than twice this capacity.)

HOT MILLER ACCESSORIES (Other than shown left below)—Bitco Automatic Bit Sorter; Bitco Automatic Bit Washer; Bitco Automatic Bit Quench; Lindberg Automatic Electric Rotary-Hearth Furnace.

Send for ILLUSTRATED BULLETINS

Right: Massco Bit Heating and Tempering Furnace — oil or gas fired, automatic heat control. Below: MASSCO Bit Quenching Unit





MASSCO Jr. Bit Grinder

DENVER
SALT LAKE CITY
EL PASO

NEW YORK CITY

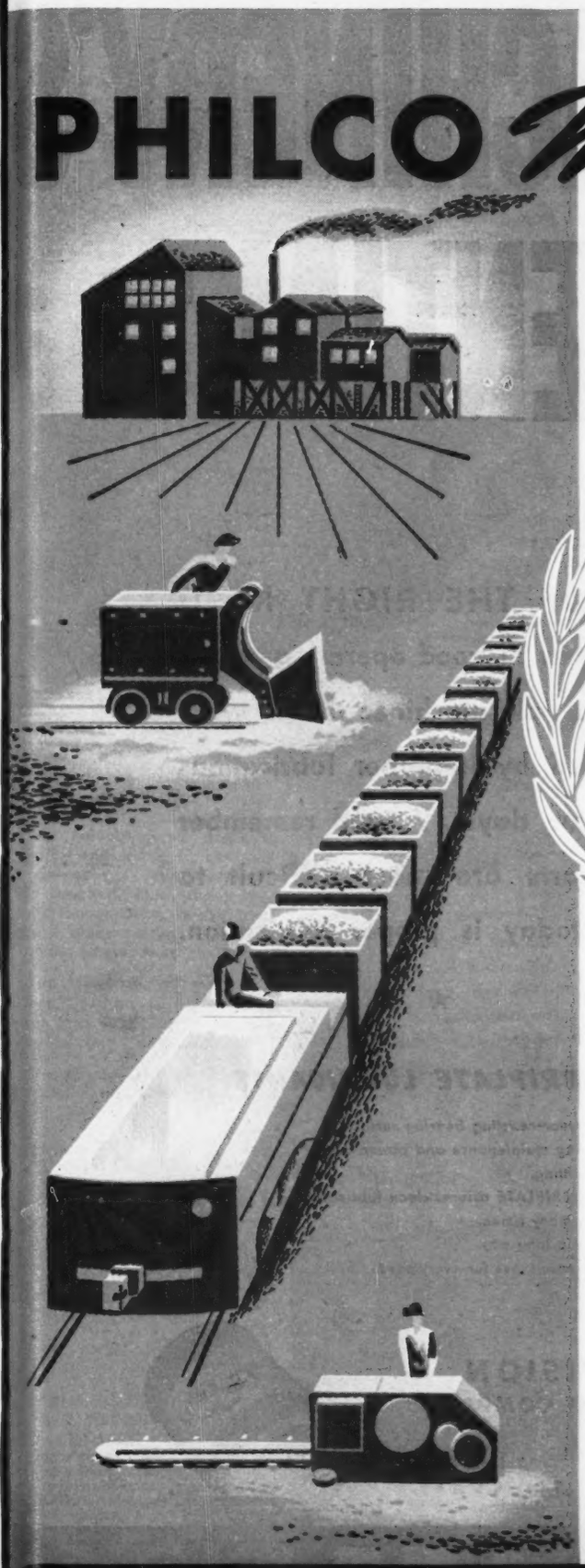
The Mine & Smelter Supply Co.

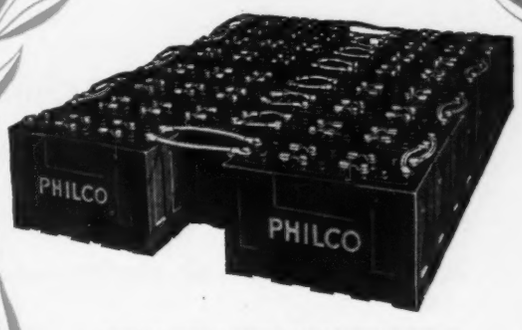
CANADIAN VICKERS, LTD.
MONTREAL

W. R. JUDSON
SANTIAGO, LIMA

PHILCO *Mine Batteries*

FOR MORE ORE ON EVERY SHIFT!





TYPICAL PHILCO MINE LOCOMOTIVE BATTERY
MADE UP OF TYPE 25 AMA MONOBLOC UNITS

With rugged, heavy-duty Philco Batteries in your mine locomotives you get the extra wallop you need to move out loaded cars *quicker* and have empties back *faster!* Furthermore, you get this extra wallop *hour after hour* because every Philco mine battery is engineered to deliver *sustained* high voltage! The Philco grid itself is designed to provide high electrical efficiency and superior conductivity. The Philco "K" Process of dehydration permits the use of flake oxide as active material, producing a plate of exceptional hardness, porosity and high capacity. These are important battery features that you get *only in a Philco!* For complete information, write for the Philco Mine Battery Catalog.

Philco Corporation, Storage Battery Division, Trenton 7, N. J.

REPLACE WITH RUGGED PHILCO BATTERIES

ARMY E NAVY

WHAT IS MACHINERY'S No. 1 ESSENTIAL?

. . IT'S LUBRICATION OF THE RIGHT KIND that will keep production machines in good operating condition and continuously on the job. Idle machines due to worn bearings, gears or chains, caused by improper lubrications are certainly on the blacklist these days . . . and remember that machine replacement parts are most difficult to get. Yes—the No. 1 essential today is proper lubrication.

★ ★

7 QUICK FACTS ABOUT LUBRIPLATE LUBRICANTS

1. *LUBRIPLATE produces an ultra-smooth, wear-resisting bearing surface.*
2. *LUBRIPLATE reduces friction, thus lowering maintenance and power costs.*
3. *LUBRIPLATE resists rust, corrosion and pitting.*
4. *Most LUBRIPLATE products are white. LUBRIPLATE assures clean lubrication.*
5. *LUBRIPLATE outlasts ordinary lubricants many times.*
6. *LUBRIPLATE is economical—a little goes a long way.*
7. *LUBRIPLATE is available in fluid and grease types for every need.*

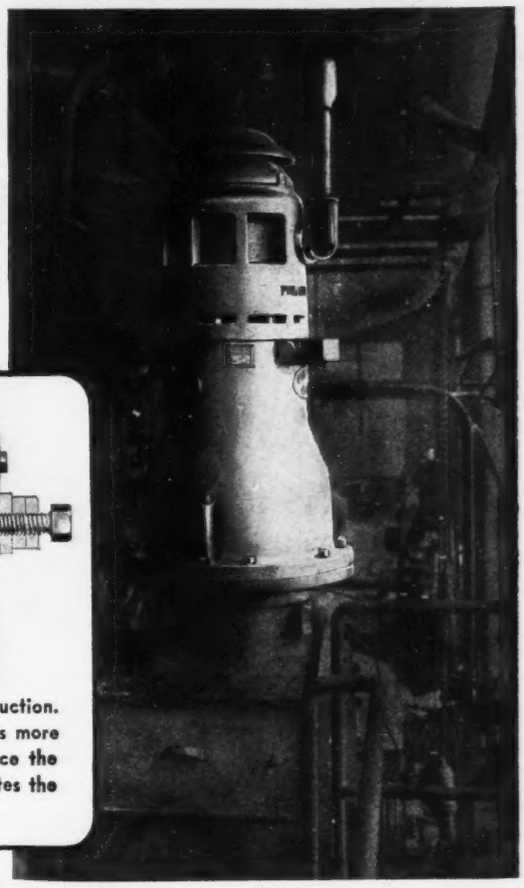
LUBRIPLATE DIVISION
FISKE BROTHERS REFINING COMPANY
SINCE 1870
Newark, N. J. Toledo, Ohio
DEALERS FROM COAST TO COAST

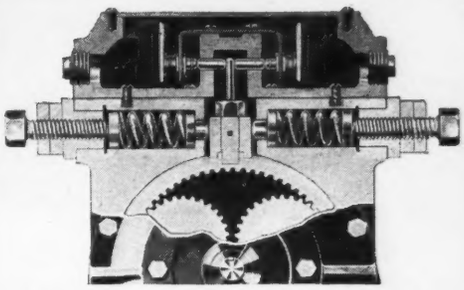
LUBRIPLATE

THE MODERN LUBRICANT *that Arrests Progressive wear*

"Its the Film"

OVERLOADING CAN'T DAMAGE EQUIPMENT DRIVEN WITH THE PLANETORQUE-MOTOREDUCER





Cut-away view showing internal construction. PlaneTorque switch responds to overloads more quickly than electrical thermal relays since the mechanical action of the overload operates the cut out switch directly.

The PlaneTorque safety feature of this self-contained drive automatically and instantly shuts-off power whenever a predetermined load limit is reached. This makes it ideal for driving stokers, conveyors, mixers and other equipment that may become jammed or overloaded.

The MotoReduceR with this feature can be had in both horizontal or vertical types in a wide range of ratios and horsepowers.

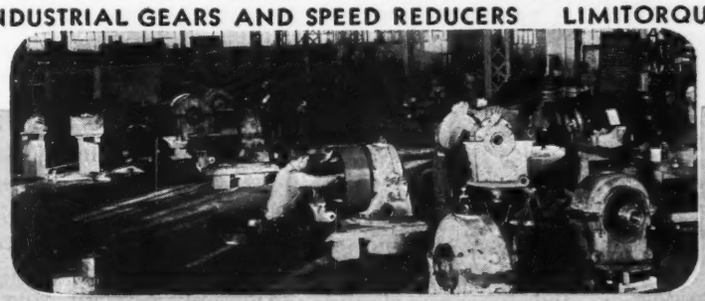
Our catalog M R 40 will give all the facts. Send for a copy.

ARMY E NAVY

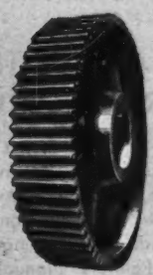
PHILADELPHIA GEAR WORKS, INC.

INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

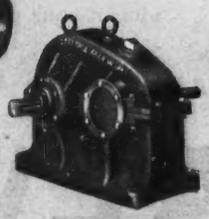
ERIE AVENUE & G STREET
PHILADELPHIA 34, PENNA.
NEW YORK, PITTSBURGH, CHICAGO



Philadelphia LIMITORQUE CONTROL operates all types of valves, etc., safely, economically, from convenient stations.



Philadelphia GEARS All types and sizes of industrial gears. Can be supplied in all materials.



Philadelphia HERRINGBONE SPEED REDUCER for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia MOTOREDUCER The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia WORM GEAR SPEED REDUCER right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Ready Now!
NEW TRAINING AIDS FOR PIPING MEN

❶ "PIPING POINTERS" SOUND FILM

❷ "PIPING POINTERS" MANUAL

FACTS ABOUT THESE NEW CRANE SERVICES

The "Piping Pointers" film is 16 mm. size with sound track. Approximate showing time, 30 minutes. Available free for showing in any plant, trade school, or industrial training center. The "Piping Pointers" manual is supplied free for all viewers of the film.

ARE your piping maintenance trainees learning fast enough to replace skilled men gone to war? Can they assure your plant of dependable piping service while replacement materials are far from plentiful?

Training of workers is made faster and doubly effective by these new Crane "Piping Pointers" services. Each complements the other in teaching the fundamentals of piping and proper care of valves and fittings to keep up pipe-line efficiency.

The "Piping Pointers" Manual is the most complete service of its type ever compiled, its chapters ranging from "The Language of Piping" to "Playing Safe on the Job." In the film, trainees see and hear how the manual's content is actually applied.

Available Free to Any Plant

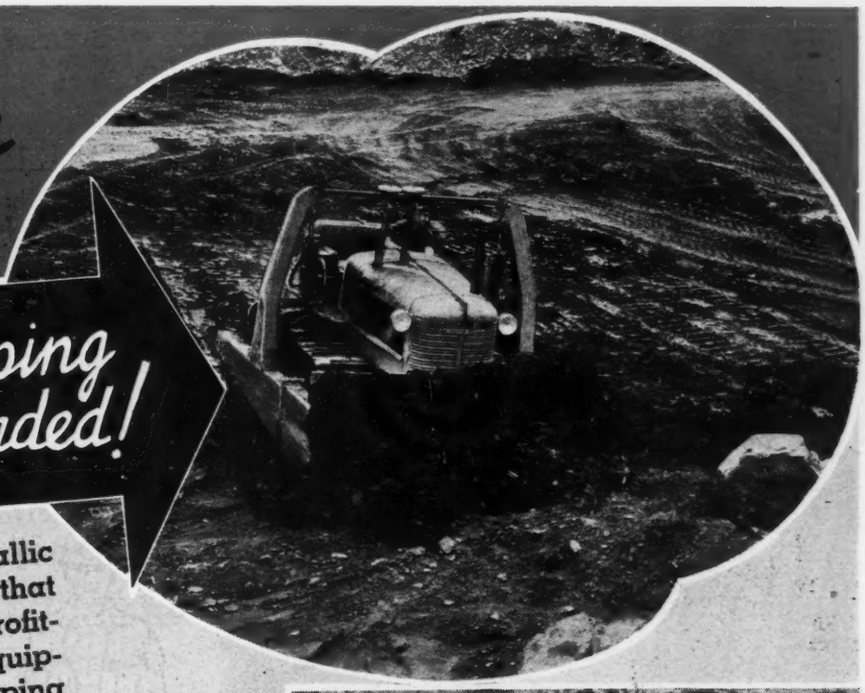
Full information about these services and suggestions for using them most profitably are available on request from your local Crane Representative. Consult him regarding manuals for your piping crews, and showings of the "Piping Pointers" film in your plant.

Crane Co., General Offices: 836 S. Michigan Ave., Chicago 5, Ill.

CRANE VALVES

BAKER Hydraulic BULLDOZERS

do small stripping jobs single-handed!

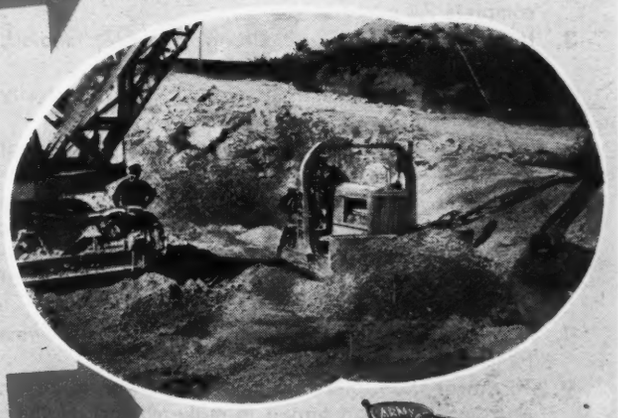


Many small deposits of metallic and non-metallic minerals that could not be operated profitably, if expensive shovel equipment were required for stripping overburden, are being worked most profitably by stripping with Baker *Hydraulic* Bulldozers. They are low in first cost, operating cost and maintenance cost.

Bakers, with their direct hydraulic lift and full down pressure on the blade, save time and manpower and minimize costs in reworking of tailings and slag, leveling slack and overburden, building access roads to mines, helping load shovel dippers and clamshell buckets, cleaning pit floors, freeing mired trucks, spotting cars and dozens of other jobs.

Regardless of the size, location or type of mine — Bakers speed output of ore. Savings vary from 7½% to 60%, but Bakers never fail to quickly return their cost. Send for Catalog 839.

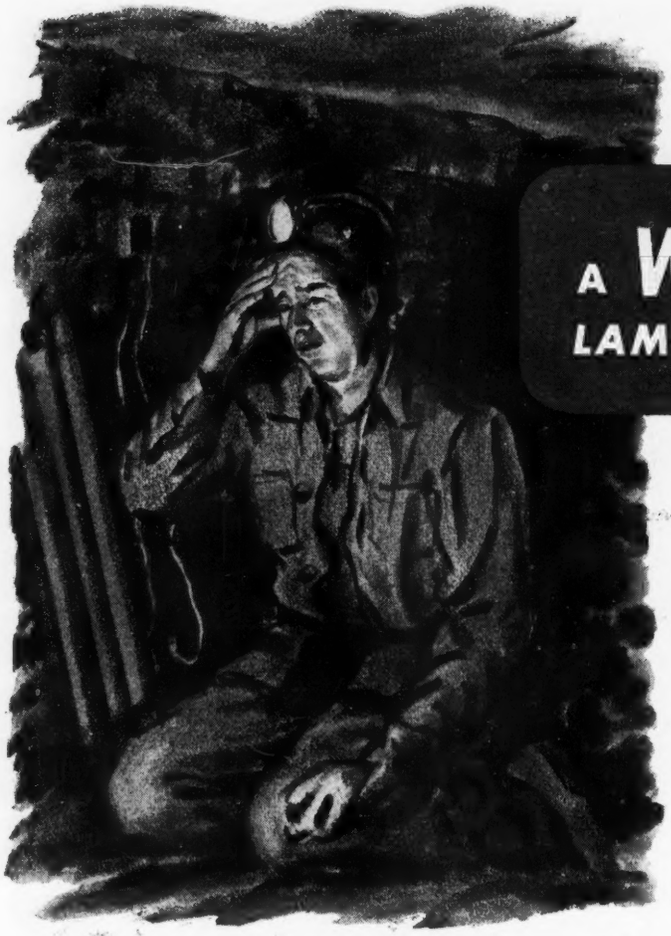
THE BAKER MFG. CO.
532 Stanford Ave., Springfield, Ill.



Awarded the Army-Navy "E" flag for proficiency in production.

BAKER

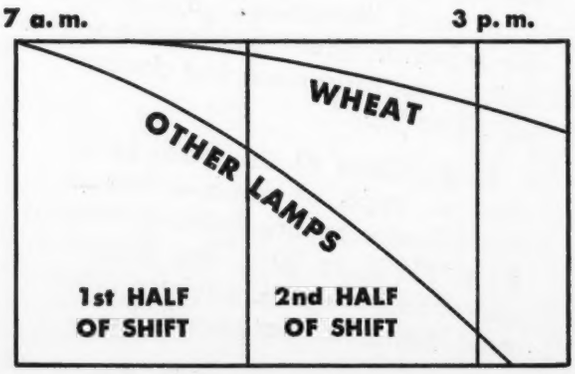
The Modern Tractor Equipment Line for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE



A WHEAT ELECTRIC CAP LAMP REDUCES EYE FATIGUE

IT's along towards the end of a shift and this miner is tired. Why? Because added to natural fatigue, the light in his cap-lamp has dimmed, causing a strain on his eyes which in turn tires his whole body —and REDUCES HIS PRODUCTION EFFICIENCY! This need not happen in your mine if you equip your miners with the NEW WHEAT CAP-LAMP. This cap-lamp maintains a better than 80% efficiency throughout a working shift. Give your miners an approved cap-lamp and reap the benefits of increased productivity and reduced compensation costs!!

Write for further particulars on the NEW WHEAT CAP-LAMP—TODAY!



THESE FEATURES MAKE *WHEAT* THE OUTSTANDING ELECTRIC CAP LAMP

1. Two bulbs (one for emergencies) — miner is never in the dark.
2. Headpiece weighs less than 6 ounces, Lamp Cord 6 ounces, Battery 62 ounces — Total weight of Lamp complete 74 ounces.
3. Headpiece molded of strong bakelite, sealed, moisture-proof and dust-proof.
4. Rubber battery case — non-conductor of electricity — a valuable safety feature.
5. Battery solution (free) limited to one ounce total both cells.
6. Lead-acid type battery maintains high voltage throughout shift (80 + percent efficiency) — year after year.
7. Battery charged through headpiece and cord of cap lamp — a daily test of all connections.
8. Designed for self-service charging system for lowest lamp-house operating cost.
9. To charge, headpiece is simply slipped on to key in charging rack, and turned to make contact. Nothing to take apart — unit-sealed construction.

SPECIALISTS IN MINE LIGHTING FOR 30 YEARS

KOEHLER MFG. CO.

Marlboro · · · Mass.

Eastern U. S. A.:
WHEAT LAMP SALES INC., Charleston, W. Va.
Western U. S. A.:
E. D. BULLARD CO., San Francisco, Cal.
Eastern Canada:
H. C. BURTON & Co., Hamilton, Ontario
British Columbia:
B. C. EQUIPMENT CO., LTD., Vancouver, B. C.

BETTER LIGHT · LESS WEIGHT
NON-SPILLABLE

Dust = Delay

Note the excellent control of dust on the job views shown here. At the top, Rear-Dump EUCLIDS at work in a stone quarry, North Carolina; hauling earth and stone for a dam in New York; Euclid tractor with special water wagon for dust control and compaction work at a California dam; right, Bottom-Dump EUCLIDS on the haul road at an airport in Florida.

● Dust on mining, industrial and construction jobs where heavy duty hauling equipment is used is much more than just a mere nuisance—it is a mighty costly item because it results in decreased efficiency of both men and machines. A diesel engine, for example, may be fitted with one or more air cleaners, but not even the finest filter can remove *all* the dust. Eventually, dust that is by-passed causes excessive wear on sleeves, bearings, pistons and other internal parts, causing premature failure and breakdowns. Moving parts which are lubricated and exposed are also damaged by the abrasive action of dust-laden grease and oil.

Time, money and equipment used in the elimination or control of dust on your jobs is a sound investment rather than an expense, and you will be helping to make hard-to-get replacement parts available for more of the equipment that must be kept in operation 'til victory.

The EUCLID ROAD MACHINERY Co.
CLEVELAND, OHIO

EUCLID

SELF-POWERED HAULING EQUIPMENT
For EARTH . . ROCK . . COAL . . ORE

CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

RING-FREE REMOVES CARBON REDUCES FRICTION, SAVES FUEL!

Don't Deprive *Any* Power Plant Of This Operating Economy!

Carbon trouble is expensive in down-time and repair bills on all sizes and types of Diesel and Gasoline engines. In every engine suffering from carbon, the first crankcase full of Macmillan RING-FREE Motor Oil begins to *remove* the carbon from pistons, rings, valves *while the engine runs.* Continued use of RING-FREE keeps the formation of destructive carbon in check. The result is a cleaner, more thoroughly lubricated, sweeter running engine.

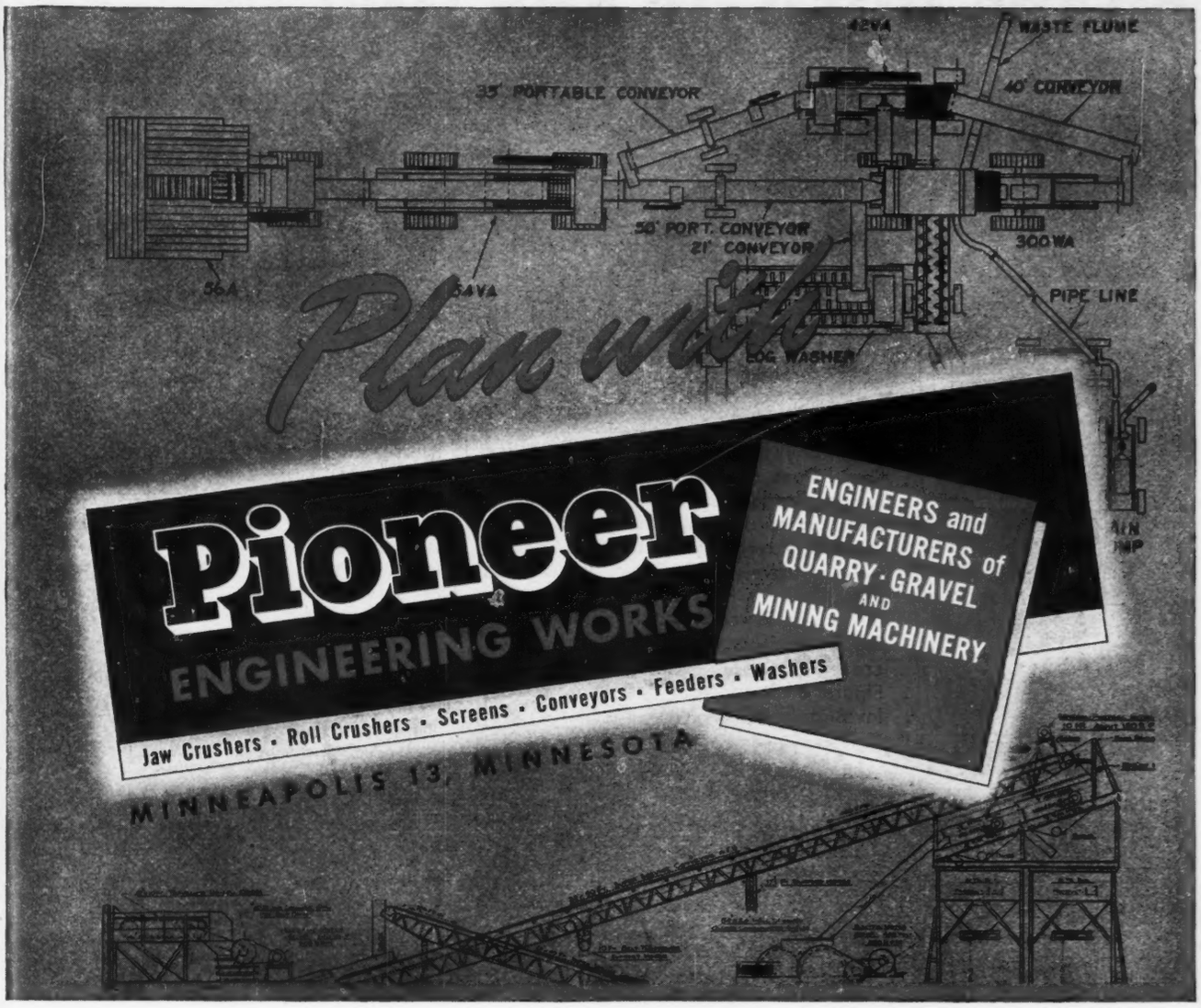
Another, even greater RING-FREE advantage is its ability to reduce friction *fast!* That actually delivers more power to the drive shaft . . . produces measurable fuel savings. It also cuts down wear and repair. Many operators who started by lubricating just one of their engines with RING-FREE were so convinced by the performance and economy obtained that they now order Macmillan RING-FREE for *all* their motorized equipment.

MACMILLAN PETROLEUM CORPORATION

50 West 50th Street, New York 20 • 624 South Michigan Avenue, Chicago 5 • 530 West 6th Street, Los Angeles 14

Copyright 1943 Macmillan Petroleum Corp.

REDUCES WEAR BY REDUCING FRICTION

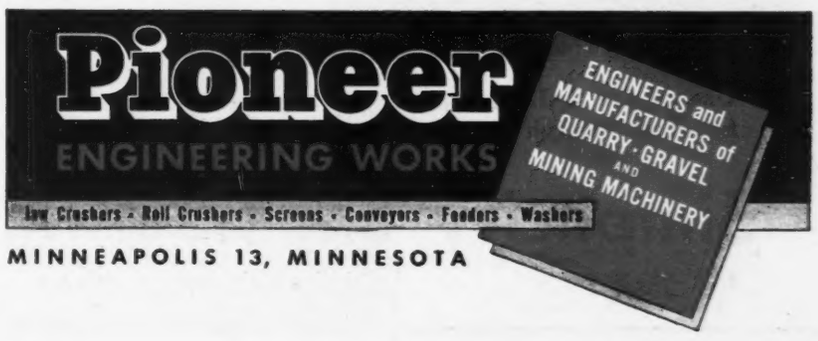


The best way to lick any job is to plan to lick it . . . to make sure that your equipment meets the requirements of the job with adequate margins . . . and meets also your personal requirements as to dependability, original investment, low processing and maintenance costs. It is for these reasons that more and more operators plan first to determine their own requirements, and *Plan with Pioneer.*

Planning with Pioneer puts at your disposal, sitting on your side of the desk, an engineering and manufacturing organization that can be of genuine help to you in selecting the type and size of any Pioneer equipment you need.

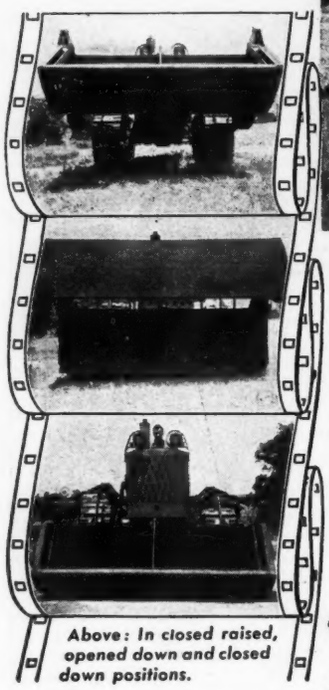
Pioneer engineering is of two phases. First is the designing of units that will do best, certain specific types of jobs. The second phase is one of coordinating these Standard Pioneer Units into a complete plant, so that all units are in balance functioning at high efficiency with relation to each other, to form a compact, integrated plant producing at a profit.

Pioneer offers you *more for your money* in terms of service, machinery and dependable continuous operation at a profit. Planning with Pioneer involves no obligation. An outline of your complete requirements and Pioneer's cooperation in advance planning to meet them, is the surest solution for your processing job. Plan first to Plan with Pioneer.

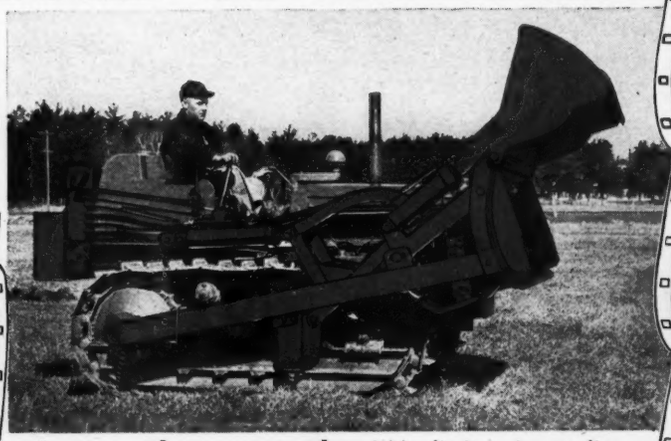

Pioneer
ENGINEERING WORKS
Jaw Crushers • Roll Crushers • Screens • Conveyors • Feeders • Washers
MINNEAPOLIS 13, MINNESOTA
ENGINEERS and MANUFACTURERS of QUARRY · GRAVEL AND MINING MACHINERY

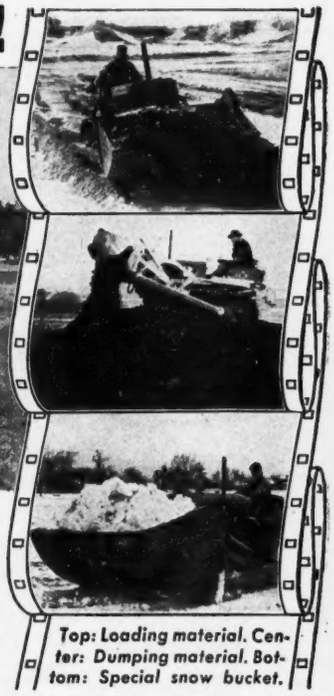
GRABS HOLD OF ANY JOB!

Drott Bull Clam Shovel



Above: In closed raised, opened down and closed down positions.





Top: Loading material. Center: Dumping material. Bottom: Special snow bucket.

Fits in anywhere . . . everywhere! No limit to its applications. Does the work of a bulldozer, shovel, scraper, tamper, grader, maintainer, hoist, clam, snow-remover. Uproots and carries stumps and trees, lays pipe, tile or cable, spreads gravel, digs ditches and trenches. Cuts smoothly while it travels . . . carries or floats loads . . . levels as it fills. Ability is PROVED on toughest jobs. Now serving the armed forces in tough jungle fighting, on sanitary fill work, filling bomb-craters, airport construction, etc. Figure on it for your Post War work. Investigate NOW! Write for literature.

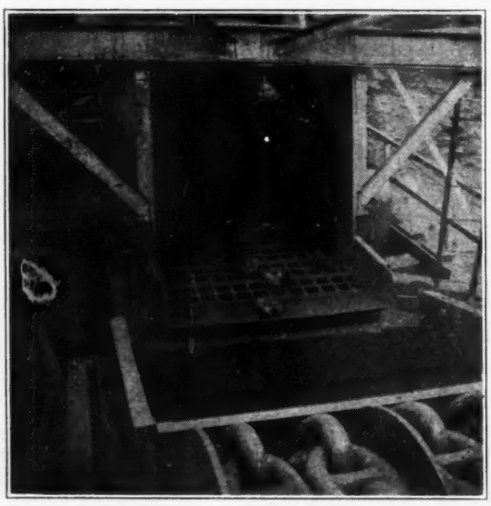
- Hydraulically controlled from operator's seat.
- Up to 3' lift above ground—one foot below.
- One to four yards heaped capacity . . . three to twelve thousand pounds lift capacity.
- Raising and lowering of front clam controls depth of cut.
- Regular bucket interchangeable with special snow bucket.

DROTT UNIVERSAL EQUIPMENT

HI-WAY SERVICE CORPORATION

3853 W. WISCONSIN AVE., MILWAUKEE 8, WIS. • 739 MUNSEY BLDG., WASHINGTON, D. C.

SIMPLICITY Gyrating Screens



One of the 5'x12' Scalpers handling 900 tph Iron Ore.

Simplicity Gyrating Screens are the answer to that troublesome screening problem, which you may have in your plants. This strong statement is based upon results secured since 1922.

Many Simplicity Gyrating Screens are now working at the mines as vibrating grizzlies, scalping off rock up to five foot in size. Other Simplicity Screens are in treatment plants, screening mineral ores into required sizes.

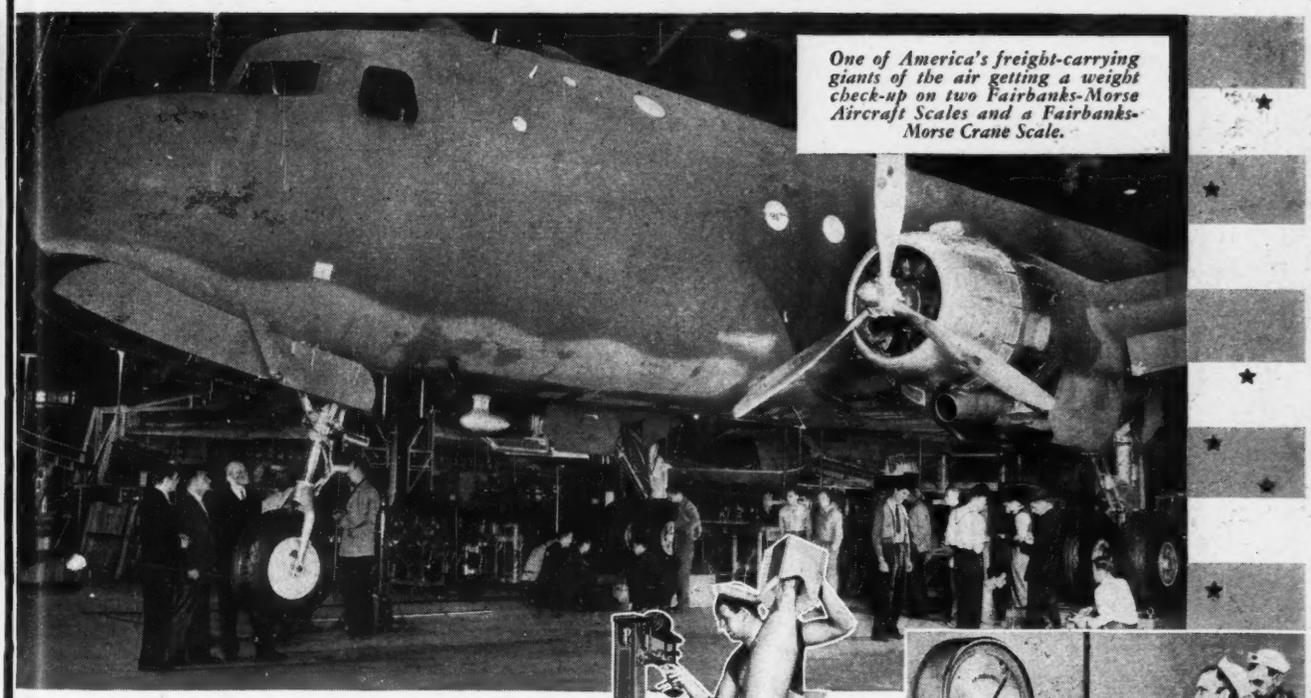
A mining official stated that these Simplicity Screens were properly constructed for mining work, and any operator who saw them in operation would be sold on their value. Results and not claims sell the Simplicity Screens.

Simplicity Gyrating Screens are supplied in many standard sizes, and where required, can be designed to meet your special requirements. Our engineering representative will recommend the proper guaranteed unit for your job.

Simplicity Engineering Company

DURAND, MICHIGAN

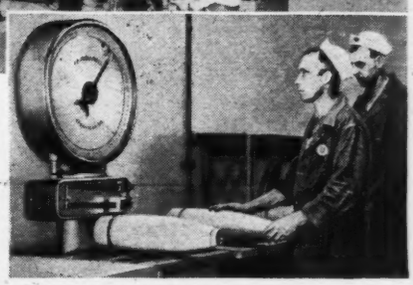
Fairbanks-Morse Scales in Warwork



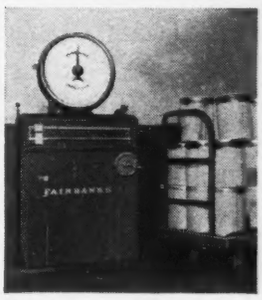
One of America's freight-carrying giants of the air getting a weight check-up on two Fairbanks-Morse Aircraft Scales and a Fairbanks-Morse Crane Scale.

• WARWORK means *weigh-work* for Fairbanks-Morse Scales. They're weighing munitions . . . food . . . chemicals . . . tanks . . . aircraft . . . shells . . . just about everything, in fact. They are weighing at speeds which human hands can't match. They're weighing with accuracy that human eyes can't equal. They're working in endless shifts that human stamina can't endure. They're helping to speed up America's war effort on the production front, for Fairbanks-Morse Scales are "at home" on the production front, in peace or in war. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago, Illinois.

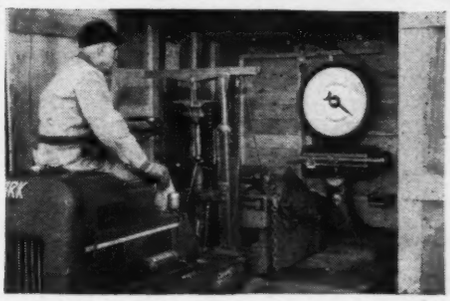
Weighing an "egg" for the Axis.



Correct weight for accurate gunnery.



Frozen eggs—NOT for the Axis!



Weighing charging materials at iron works furnace.

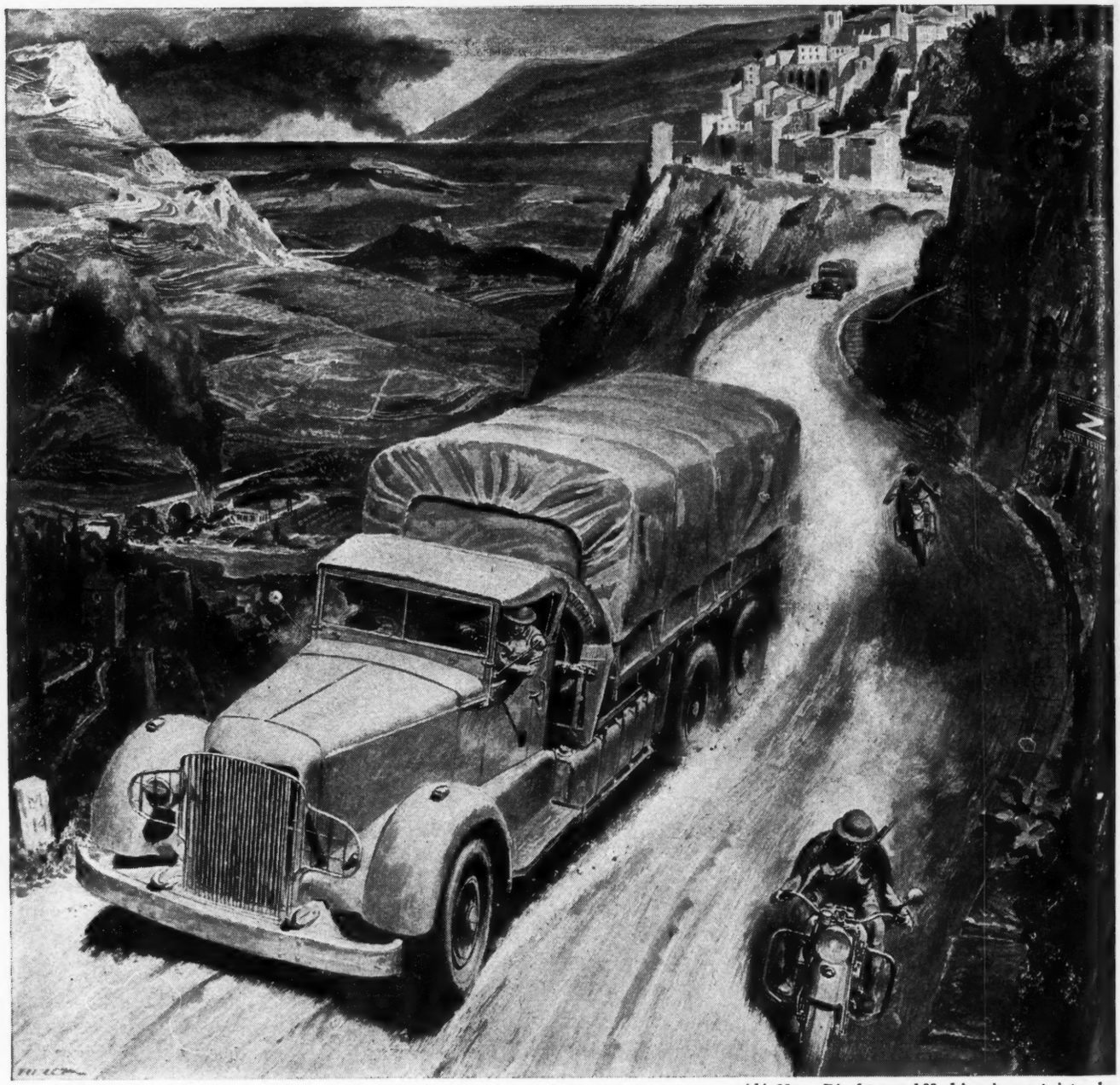
★ ★ ★

FAIRBANKS-MORSE

DIESEL ENGINES · WATER SYSTEMS
PUMPS · SCALES
MOTORS · STOKERS
GENERATORS · FARM EQUIPMENT
RAILROAD EQUIPMENT

Scales

BUY WAR BONDS



A big 10-ton, Diesel-powered Mack in grim war paint rushes supplies to the front. Sketched from photos, by Peter Helck.

©1943 MACK MFG. CORP.

WAR REPORT...WITH A PEACETIME TWIST?...

For your future reference, we'd like to put two facts on the record now. *Fact One*—there are *more* Mack Diesels in the United Nations' armies than any other make of heavy-duty Diesel truck. *Fact Two*—the only 10-ton Diesel trucks used by United Nations' armies which are made and powered by one manufacturer are Macks. This may surprise you . . . and it may mean a lot some day when *you* are deciding what Diesel to buy.

Mack Trucks, Inc., Empire State Building, New York, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J. Factory branches and dealers in all principal cities for service and parts.

Mack

TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY...IF YOU PLAN TO GET ONE, YOU'RE WISE!

An Army Without Copper Is Licked Before It Starts...

Thanks to America's great mining industry, our armed forces on every front are able to "give" more than they receive. Tremendous amounts of metal are not only hurled at the enemy, but play a vital part in many sensitive instruments and equipment that make up our efficient fighting machine.

The Signal Corps alone needs 5000 tons of copper every month for radio, telegraphic and telephonic equipment. Sharples Pentasol Amyl Xanthate contributes materially to this production, for its great power of flotation results in copper yields of 75% from old tailings running as low as .42% copper!

Other hard-to-float ores respond just as readily to the flotation power of Pentasol Amyl Xanthate: wulfenite, vanadinite, sulphides and many marginal ores formerly too costly to work. Try Pentasol Amyl Xanthate and let your wartime recoveries give the Axis another jolt. The commercial product is Bear Brand Z-6, made by Great Western Division, The Dow Chemical Company. Your samples will be forwarded promptly.

SHARPLES CHEMICALS AT WAR

AMYL ALCOHOLS • AMYL ACETATE
AMYL PHENOLS AND DERIVATIVES
ALKYLAMINES AND DERIVATIVES
ALKYLAMINOETHANOLS
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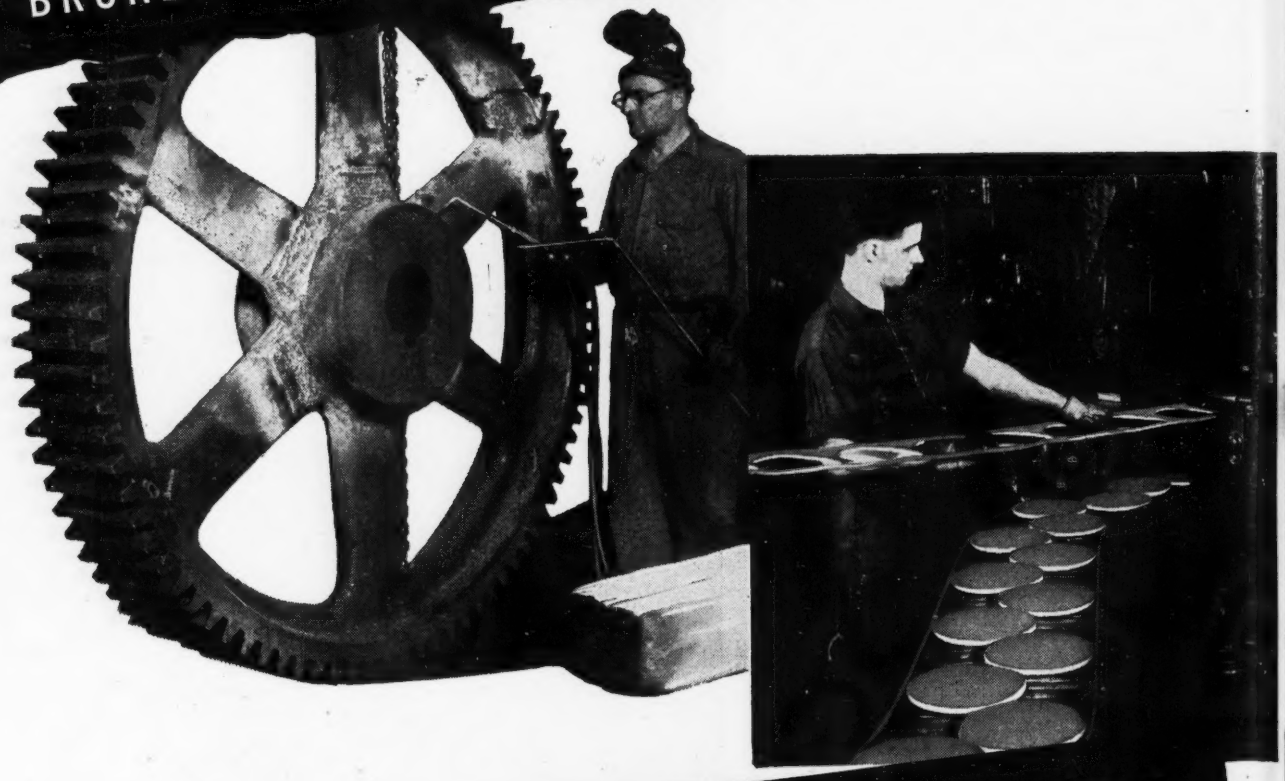
ARMY E NAVY

SHARPLES CHEMICALS INC.

Philadelphia *Chicago* *New York*

BUY WAR BONDS SHARPLES TRADE MARK CHEMICALS ...REGULARLY!

BRONZE REPAIR WELDS LIKE THIS . . .



REDUCE *"down time"* ON WAR PRODUCTION

Anaconda 997 Low-Fuming Rod repairs this fractured press gear for punching artillery shell discs . . . saves several months delay for replacement.

When this large gear on a press punching out shell case discs cracked and ground to a stop, it was apparent that a new gear could not be obtained for several months. But production was interrupted for only two weeks—thanks to low-temperature bronze repair welding with Anaconda* 997 Low-Fuming Rod. The Hebeler Welding Company of Buffalo, New York, well-known specialists, did the job using 125 pounds of rod and 900 feet of oxygen and acetylene. Chipping and welding required but 55 manhours.

This is but one of countless instances where Anaconda Welding Rods including Anaconda 997 and Tobin Bronze* have saved valuable production time in war-essential industries. Consider their use before scrapping any important machinery that seems beyond salvage. 4388

*The trade-marks "Anaconda" and "Tobin Bronze" are registered in the U. S. Pat. Off.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

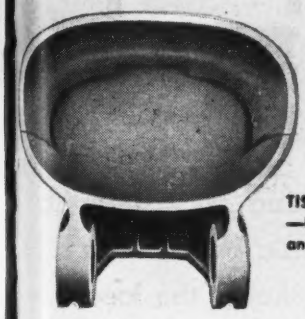
ANACONDA
Seam mine to customer

Anaconda Welding Rods

BACK THE ATTACK WITH AN EXTRA WAR BOND

Lost in Action!

TISCO
MANGANESE STEEL
DREDGE BUCKETS



TISCO Rivetless Buckets —Patented in the U.S.A. and other countries.

TISCO Flexible Tongue Pin Lock— Patented in U. S. A. and other countries.

TISCO Riveted Bucket.

WHEN the Jap hordes swept South, through Thailand, Burma, Malaya and the Netherlands East Indies, two-thirds of the world's tin supply was lost and some of the world's finest tin dredging equipment was destroyed or captured. Many of these giant dredges were equipped with TISCO Manganese Steel Dredge Buckets—chosen for their outstanding ability and efficiency.

The manufacture of dredge buckets must wait for our present job of supplying ordnance for victory, repeating a task we have undertaken in every war since the Revolution.

When the Japanese scourge has been forever wiped out, tin dredging in the Far East will start again with newer and better equipment, and TISCO Manganese Steel Dredge Buckets will be better made and do a better job than those "LOST IN ACTION".

Est: TW 1742

Taylor-Wharton Iron and Steel Co.

HIGH BRIDGE, NEW JERSEY • EASTON, PENNSYLVANIA

When You Rebuild Locomotives

Make a BETTER JOB *with* . . .

Westinghouse HYDRAULIC BRAKE

The rebuilt locomotive is then able to handle heavier loads, at higher speeds, with greater safety. Graduated control permits accurate, time-saving spotting. Flexible fluid power, under finger-tip guidance, replaces slow, cumbersome hand braking. Operator fatigue is eliminated. More output is attained at less cost in man hours, equipment and maintenance.

No need for motor bucking and dragging brake shoes—the hydraulic brake does *all* the braking. Relieved of shocks the locomotive stays on the job longer. Motor repair costs are greatly reduced. No rebuilding of the existing brake system is required—the hand brake and levers are retained and the hydraulic brake devices readily added.

TYPICAL RESULTS REPORTED BY ONE USER

Brake Shoe Life Increased from One Week to Three Months ★ Wheel Turning Decreased 50% ★ Motor Bucking to Check Speed or Stop, Entirely Eliminated ★ Shocks to Mechanical and Electrical Apparatus Greatly Reduced ★ Less Sand Required—Better Rail Contact Cuts Power Loss and Overheating.

WESTINGHOUSE AIR BRAKE CO.

INDUSTRIAL DIVISION - WILMERDING, PA.

POWERFUL PORTABLE PUMPS

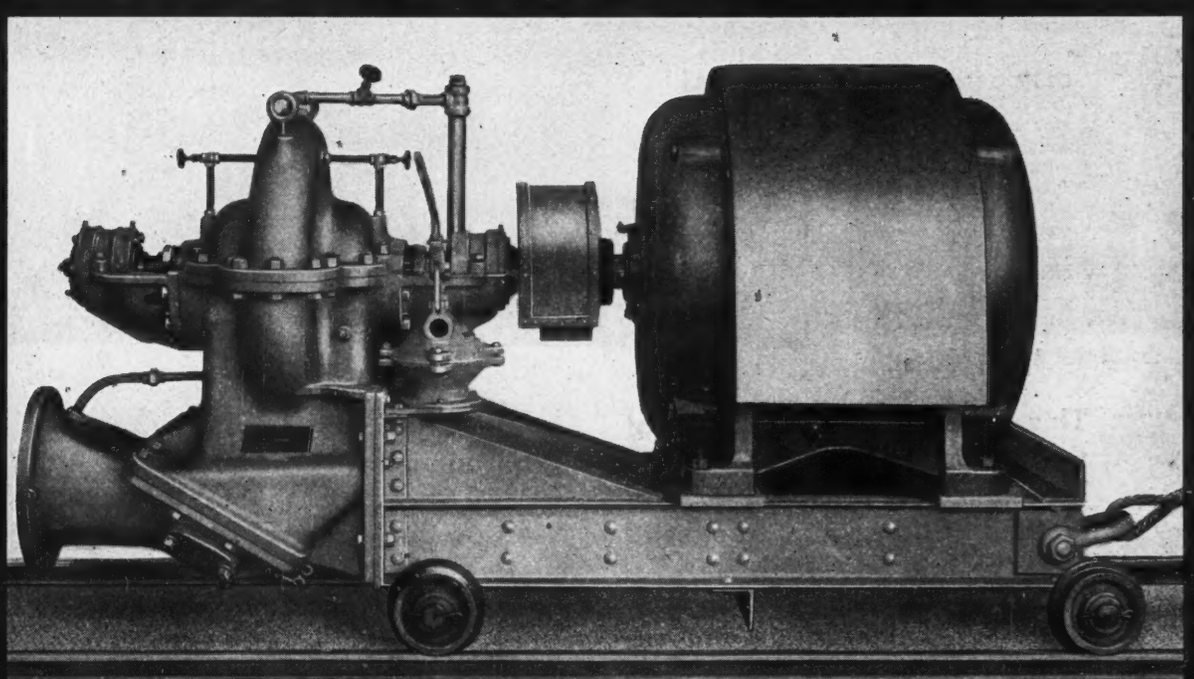
100 to 800 H. P.

For EMERGENCY PUMPING

Are you in a hurry to dewater your mine? Here's just the pump to meet that emergency—a Barrett, Haentjens Sinking Pump which gives you great flexibility in power . . . 100—800 H.P.

These pumps have built-in strainer and work without noise or vibration on heads from zero to maximum—in horizontal, inclined or vertical position.

Other advantages: they require no foundation—remain in alignment under all conditions. For detailed data write for Bulletin No. 14.



BARRETT, HAENTJENS & CO.

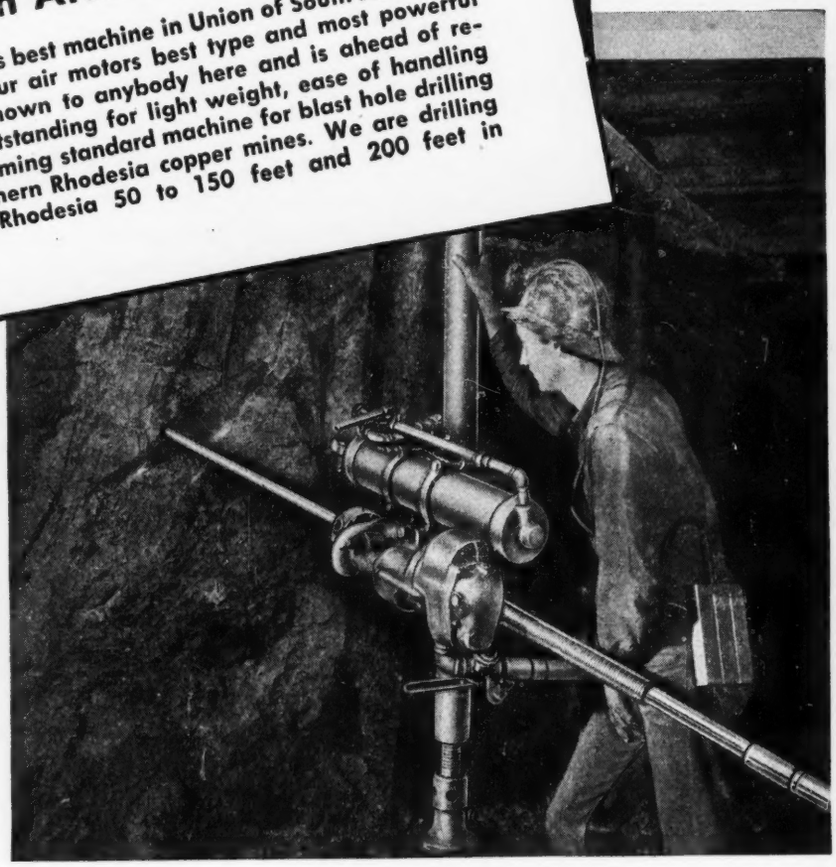
Manufacturers of Drainage Equipment for—

THE MINING INDUSTRY

Main Office and Works — Hazleton, Penna.

REPORTING ON 73 CP No. 5 DIAMOND CORE DRILLS In Service in the Union of South Africa and Rhodesia

"CP No. 5 Diamond Drill is best machine in Union of South Africa and Rhodesia and four by four air motors best type and most powerful on any diamond drill known to anybody here and is ahead of requirements. No. 5 is outstanding for light weight, ease of handling and simplicity. It is becoming standard machine for blast hole drilling up to 150 feet in Northern Rhodesia copper mines. We are drilling blast holes Northern Rhodesia 50 to 150 feet and 200 feet in Asbestos Mine."



CP No. 5 Diamond Core Drill in Utah silver-lead-zinc mine. CP No. 5 weighs only 160 pounds without rod puller, mounts like a drifter on any rock drill saddle, works in any position from column, arm or cross bar.

This cable tells its own story of the performance of 73 CP No. 5 Diamond Core Drills in the Union of South Africa and Rhodesia. Note the reference to the powerful CP air motor, the light weight, ease of handling and simplicity of the CP No. 5 Diamond Core Drill. Note, too, its performance in difficult blast hole drilling.

Introduced only two years ago, CP No. 5 has quickly established itself as the diamond core drill preferred by drilling contractors and mining operators in the United States, Canada and foreign countries. Write for a copy of Bulletin No. 311.

★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
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AVIATION ACCESSORIES

How many million tons before victory?

HOW much copper and iron ore? How much limestone and coal? . . . Frankly, we can't tell you. But we can tell you that these big electric shovels will keep relentlessly at their jobs of digging strategic materials no matter how many million tons it takes.

Because *steady uninterrupted* production is always the important thing in open pit mining — in war or in peace—that's the goal upon which P&H engineers have focused their attention for years.

For example, as far back as 1935, P&H brought a great improvement to the conventional electrical shovel control system — a new exciter unit which smooths out power surges, eliminates all need for contactor replacements, reduces electrical breakdowns and lost production time to a new minimum.

P&H's sixty years of experience in applying electrical power to the handling of heavy loads has produced many outstanding developments like this. And the mining of vital materials by P&H Electric Shovels is but one of many ways P&H products are serving America in the march to Victory.

P&H

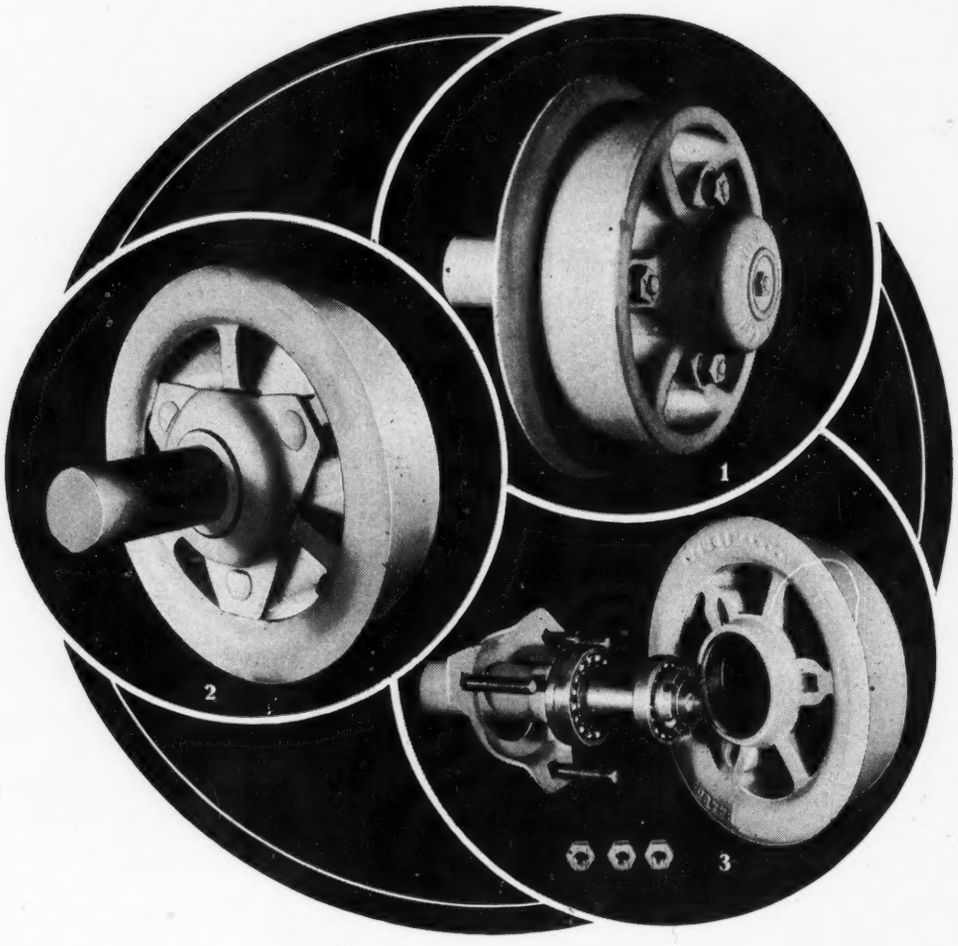
HARNISCHFEGER CORPORATION

EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · P&H · HOISTS · WELDING ELECTRODES · MOTORS

4454 West National Avenue
MILWAUKEE 14, WISCONSIN
Electric Cranes • Electric Hoists • Arc Welders
Excavators • Welding Electrodes

EVENTUALLY—

—you'll use this wheel!



★ The S-D "Floater" Ball Bearing Wheel, unquestionably, is the mining industry's most perfect, simplest, easiest running, and most economical wheel. We sincerely believe that you will use this wheel once you know its advantages. Our past experience has proved the real worth of "Floaters" to you. Proof records of service have made it possible for us to give you a written guarantee against breakage of wheel castings or failure of bearings for five years. And, if you have to grease "Floaters" more than once in five years, we pay the extra costs. Where else can you get such wheel protection?

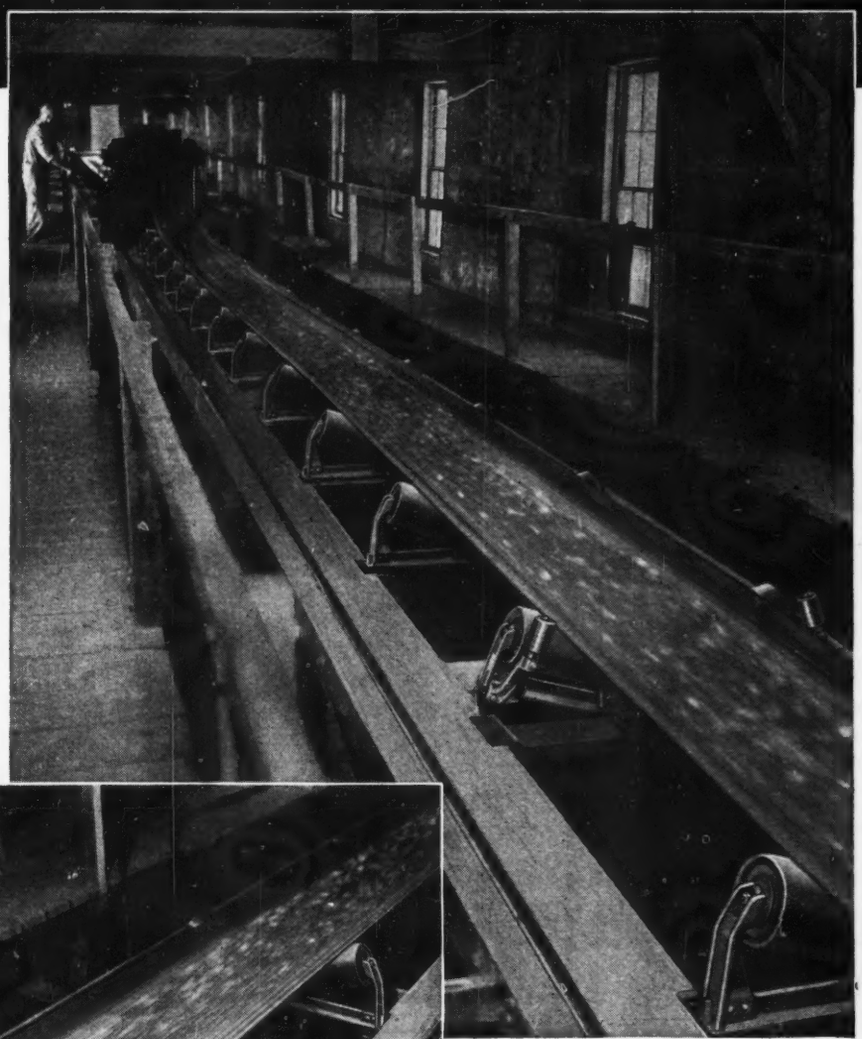
The illustrations on this page show the simple, demountable feature of "Floaters". In photo No. 1 you see the three nuts which hold wheel in place. Remove these—that's all—and your wheel slips off, just like an auto wheel. Shown also is the closed front hub and grease connection —no grease leakage here! Photo No. 2 shows the rear hub cap drawn tight with the three bolts and nuts. Photo No. 3 shows how the bearings remain in place on axle in perfect adjustment when wheel is taken off. No further adjustment is required when wheel is replaced.

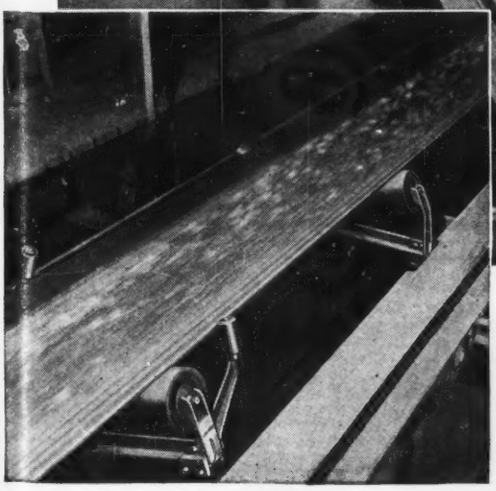
Tests made by strictly independent engineering firms have proved that the net loads handled by locomotives can be increased tremendously when cars equipped with wheels having any other type of bearings are changed to S-D "Floater" wheels. The power saving is a big item.

Write to us for the complete story on how you can increase production at great savings with "Floaters". Get our Free Trial Offer.

Sanford-Day Iron Works, KNOXVILLE, TENNESSEE

KEEPING ZINC-LEAD ORE "On the Move" with LINK-BELT Belt Conveyors





In foreground of this picture is shown a Link-Belt Series "100" Pivoted Self-Aligning Idler—one of a number of such idlers used on this installation—serving automatically to keep the conveyor belt in proper alignment, without exerting hard or continuous pressure on belt edges.

● To meet wartime requirements for critical metals, Golden Cycle Corp., operators of one of the largest gold recovery plants, have converted the flotation section of their custom gold mill to the production of lead and zinc concentrates.

In keeping the ore "on the move," belt conveyors perform a very important job. The illustrations show their 300-ft. long, 24" wide, Link-Belt Anti-Friction Belt Conveyor with automatic tripper for discharging the crushed ore into any of 25 storage bins, as desired.

Link-Belt pioneered in the development and manufacture of anti-friction belt conveyor idlers. Today, Link-Belt designs offer the best in belt conveyor equipment for handling a wide range of materials . . . to speed-up production for Victory.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, New York 7, Toronto 8.

Offices, warehouses and distributors in principal cities. 9357

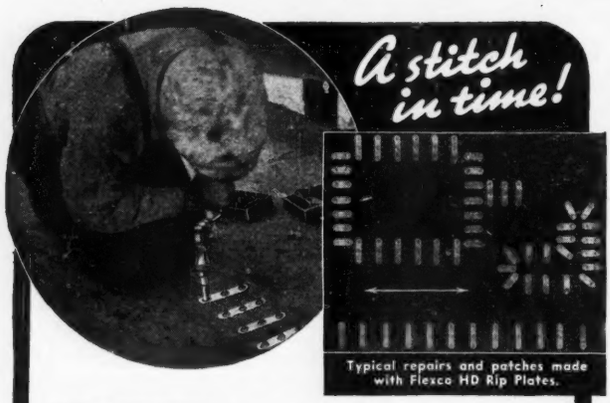
Chicago Plants · Indianapolis Plant · Ordnance Plant

LINK-BELT

THE SYMBOL OF QUALITY · LINK BELT COMPANY

BELT CONVEYOR EQUIPMENT

IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • DRIVES



Typical repairs and patches made with Flexco HD Rip Plates.

THOUSANDS of men in industrial plants, mines and mills all over the country are doing just what this man is doing. They are cutting costs by repairing conveyor belts with Flexco HD Rip Plates.

WRITE TODAY FOR BULLETIN F-100 that shows how easy it is to repair rips, to strengthen soft spots and to put in patches by using Flexco HD rip plates. The bulletin also shows how to make tight butt joints in both conveyor and elevator belts with Flexco HD Belt Fasteners. These fasteners are made in six sizes. Furnished in special analysis steel for general use and in various alloys to meet special conditions.

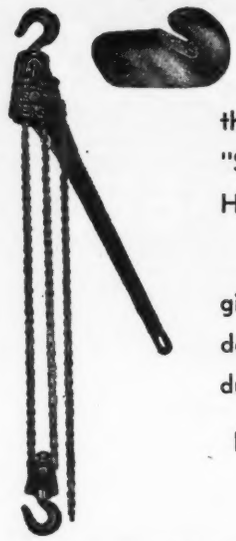
Flexco HD Rip Plate

Flexco HD Belt Fastener

FLEXIBLE STEEL LACING CO.
4635 Lexington St., Chicago, Ill.

FLEXCO HD BELT FASTENERS
REG. U.S. PAT. OFFICE
Sold by supply houses everywhere

ONE LITTLE HOOK



that gives the Coffing "Safety Pull" Ratchet Lever Hoist superiority.

One little hook that will give you an easily converted double-power and double-duty hoist.

Write today for Catalog GI 6

COFFING HOIST CO.

Manufacturers of

Ratchet Lever, Spur Geared, Electric and Differential Hoists, Trolleys, Utility Maintenance Tools.

DANVILLE, ILLINOIS

IN A CLASS BY ITSELF

the New Improved

"PENNSYLVANIA IMPACTOR"

Shatter by direct impact or "batting" operation *not found in any other type.* Designed for economic *secondary* reductions of high silicas, clinkers, slags, chrome and manganese ores and other industrial minerals, commercial stones and furnace refractories. Reduction is faster with Pennsylvania Impactors—greater output per H.P.

Send for Bulletins 6000 and 6010

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PLACER GOLD

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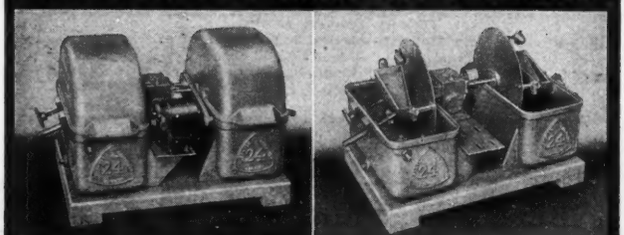
EMPIRE DRILL

NEW YORK ENGINEERING COMPANY

75 West St., N. Y. City, U.S.A. Cable Address, NYECO, N.Y.

DENVER WET REAGENT FEEDERS



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MEXICO, D.F.: Edificio Jalisco, Calle Ejido No. 7
MIDDLESEX, ENG.: 482A, Northolt Rd. S. Harrow
RICHMOND, AUSTRALIA: 530 Victoria Street
JOHANNESBURG, S. AFRICA: 8 Village Road

DENVER EQUIPMENT COMPANY, 1400 17th St., Denver, Colorado

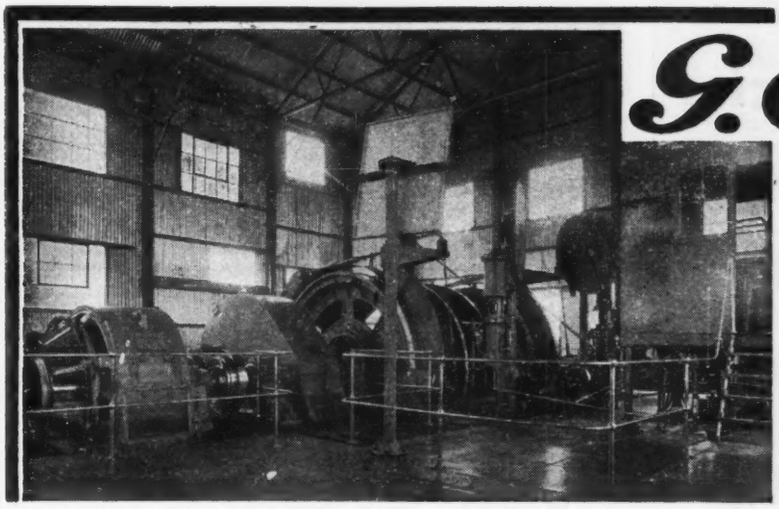
McLANAHAN EQUIPMENT

Single and double roll and jaw crushers, hammer mills, super dry pans—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.

Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

McLanahan & Stone Corp.

Established 1835
HOLLIDAYSBURG
PENNSYLVANIA



G.E.C.-Fraser & Chalmers 1,350 h.p. direct current Ward-Leonard electric winders installed at the Randfontein Mines, South Africa.

G.E.C.

FRASER AND CHALMERS Steam and Electric WINDING PLANT

Made in England

G.E.C.-Fraser & Chalmers Steam and Electric Winding Engines, already installed and in course of manufacture, cover all the mining centres of the world. These winders embody all the latest safety devices and simplified methods of control.

The extensive experience and specialized manufacturing knowledge of this company with both steam and electric winding plants, enables the most expert and unbiased advice to be offered on any winding proposition.

Manufacturers

FRASER AND CHALMERS ENGINEERING WORKS

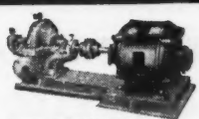
(Proprietors: The General Electric Co., Ltd., of England)

ERITH, KENT, ENGLAND

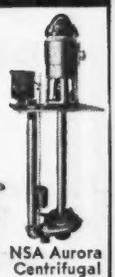
You Can Say It With PRIDE

"IT'S AN AURORA PUMP"

Type AD Hor. Split Case, Two Stage Centrifugal



Type OD Hor. Split Case Double Suction Single Stage Centrifugal



NSA Aurora Centrifugal Sump Pump

Type GMC Close-Coupled Centrifugal

Type GGU Side Suction Single Stage Centrifugal

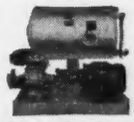
Aurora Pumps are the products of Experience. The Aurora Personnel has but ONE objective—the building of fine pumps. We are not jacks of all trades. We are exclusive pump builders. The splendid record of thousands of Aurora Pumps on a myriad of war services is your assurance that your post-war needs will be superbly taken care of as you, too, install "Pumps by Aurora."

Write for CONDENSED CATALOG M

The ONLY MOVING PART IN The APCO

APCO TURBINE-TYPE PUMPS—the simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

APCO Single Stage Turbine-Type



APCO Horiz. Condensation Return Unit

DISTRIBUTORS IN PRINCIPAL CITIES

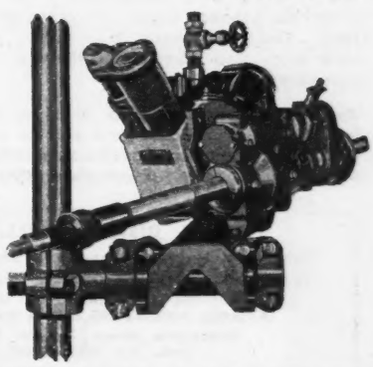
AURORA Always PUMPS

AURORA PUMP COMPANY

86 Loucks Street, AURORA, ILLINOIS

SPEED, POWER, ADAPTABILITY!

MODEL "JV" AIR DRIVEN DIAMOND DRILL



Model "JV" Diamond drill gives you speed, power, economy, adaptability. Use it for general mine work, blast-hole and prospect drilling underground. Light, for easy moving, it's powerful enough for depth exploration (to 500 ft.). Rugged compressed air motor has lots of stamina. Size core recovered ⅞" or 15/16". Diam. hole drilled 1½".

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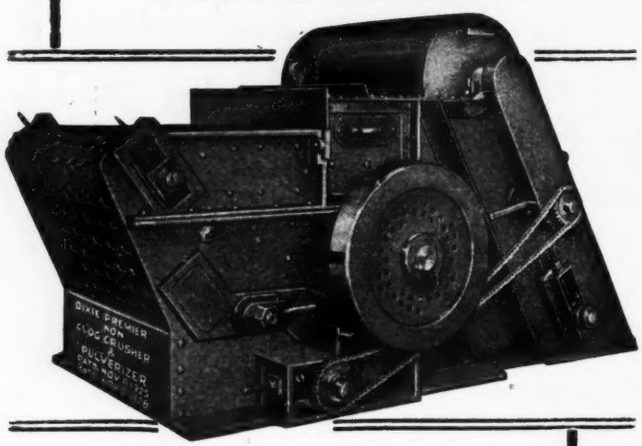

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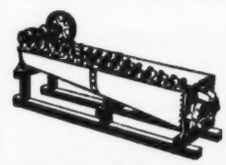

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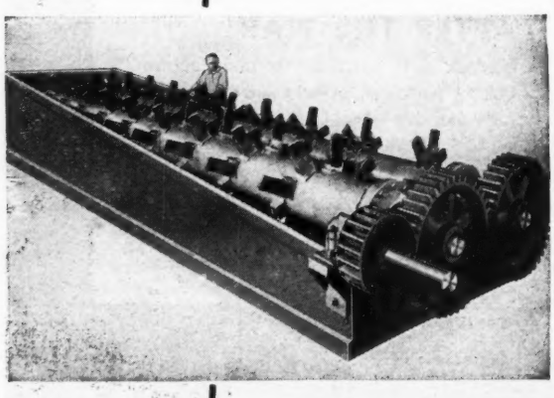

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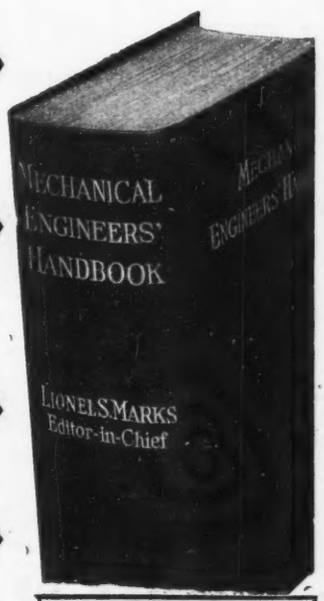

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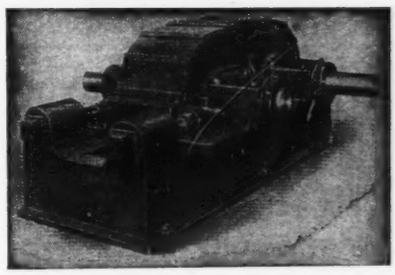
2—2" Union—6-Stage
4—2½" Pennsylvania—4-Stage
1—2½" Byron Jackson—4-Stage
1—2½" Pacific—6-Stage
1—3" Byron Jackson—4-Stage
1—3" Hill—3-Stage
1—3" Worthington—2-Stage
1—3" Pennsylvania—4-Stage
2—3" United—5-Stage
5—3" United—6-Stage
2—3" Union—6-Stage
1—4" Platt Iron Works—2-Stage
1—5" Fairbanks-Morse—2-Stage
1—6" Manistee—2-Stage
1—6" Dayton-Doud—2-Stage
4—6" Worthington—3-Stage
3—4"x3" Allis-Chalmers—4-Stage Motor Drive
2—5"x4" Allis-Chalmers Motor Drive
1—5" Cameron—6-Stage Motor Drive
2—6" Manistee—8-Stage Motor Drive

CONCENTRATING TABLES

39—No. 6 Wilfley
5—No. 11-D Wilfley
18—Deister Plat-O, Right Hand
31—Deister Plat-O, Left Hand



CRUSHING ROLLS

1—20"x8" Davis Standard Rolls
2—27"x14" McFarlane
2—27"x14" Walker
2—36"x16" Davis Standard
4—36"x16" McFarlane Rolls
1—36"x16" Dewco Convertible
3—40"x16" Colo. Iron Works
4—42"x16" Colo. Iron Works
1—54"x20" Garfield Type Rolls

BATTERY LOCOMOTIVES

1—1½-Ton Atlas Trammers
1—2½-Ton Jeffrey—Inside Wheels
2—3-Ton Whitcomb
1—3½-Ton Jeffrey—Inside Wheels
5—3½-Ton Jeffrey—Charged by Trolley
2—3½-Ton Atlas—Type B
1—5-Ton Mancha—"Whippet X"
1—7-Ton Mancha—"Hercules"
4—6-Ton Westinghouse—Bar Steel Frames

ROASTERS

1—16'-6 Hearth Herreshoff Roaster

REBUILDERS OF MINING AND CONCENTRATING MACHINERY SINCE 1898

BETTER MACHINERY—IT'S FULLY RECONDITIONED

ESTABLISHED 1898

MORSE BROS. MACHINERY CO.

P.O. BOX 1708 DENVER, COLORADO, U.S.A. CABLE "MORSE"

DEPENDABLE RECONDITIONED MACHINERY — MINING ★ ELECTRICAL INDUSTRIAL ★ MILLING

1775 BROADWAY, NEW YORK CITY

AIR COMPRESSORS:
(7) Steam 46 ft., 66 ft., 300 ft., 600 & 1000 ft.
(12) Belted, 360, 676, 870, 1300 ft.
(6) Electric, 1300, 1500, 1722, 2600, 5000 ft.
(14) Gasoline, 110, 160, 220, 310 & 370 ft.
6 Diesel 105, 315, 420, 603, 1000 & 1500 ft.

HYDRAULIC CARWHEEL PRESSES:
100 Ton, 150 Ton, 200 Ton, 300 & 400 Ton Caldwell-Niles-Wood Watson Stillman

STORAGE BATTERY LOCOMOTIVES:
3—3 ton Whitcomb, 24 Ga.
6—5 ton Whitcomb & Mancha, 30 Ga.
4—4 ton Goodman, 36 Ga.
3—5 ton G.E., 36 Ga.
4—6 ton Goodman, 36 Ga.
5—8 ton Baldwin-Westgh., 36 Ga.
4—13 ton G.E., 36 Ga.
6—Goodman 10 ton, 36 Ga.

TROLLEY LOCOMOTIVES:
3—3 ton & 2—4 ton Goodman 36 Ga.
5—6 ton Baldwin Westgh., 36 Ga. Comb.
4—6 ton Goodman 42 Ga. & 3 Goodman 36 Ga.
3—8 ton Goodman 36 Ga.
4—6 ton Baldwin-Westgh., 42 Ga.
3—8 ton & 10 ton G.E., 42 Ga.

DIESEL & GAS LOCOMOTIVES:
5—9 & 15 ton Plymouth, 36 Ga. Diesel
3—Whitcomb 12 & 15 ton Std. Ga. Gas.

RUBBER CONVEYOR BELTS:
1000' 60", 600' 30", 300' 20", 1600' 42", 500' 40", 1150' 36", 1200' 24", 900' 18", 600' 16", 350' 14".

CONVEYOR PARTS:
Idlers, Head & Tail Pulleys, Steel Frames, Tripper, etc., 14 in., 60 in. Large Stock in Jersey

SYNC. MOTOR GENERATORS:
5-15-25-40 kw. Battery Chargers
5—50 KW 1800 RPM 3/60/440-120 V
100 KW Westgh. 900 RPM 3/60/2200-250-275
100 KW Ridgway 1200 RPM 3/60/2200-250-275
150 KW G.E. 1200 RPM 3/60/2200-250-275
200 Ridgway 900 RPM 3/60/2200-250-275

VIBRATING SCREENS:
7—Hummer 3x6, 4x5, & 4x8.
5—Niagara 3x5, 4x6, & 4x8.
1—Rotex 4x6.
5—Link Belt 4x8, 4x10, & 5x12.

ROTARY KILNS:
5'x24', 7'x40', 6'x60', 7'6"x125', 8'x160

ROTARY DRYERS, Direct Heat:
Double Shell: 5'x26', 5'x30', 5'6"x60', 80"x45'
Single Shell: 5'x30', 6x40, 6x50, 6x60, 7x60 8x120
Indirect Heat: 2—4'x20', 5x30, 6x40

STEEL WATER TANKS ON TOWERS:
100000 gal. on 100' tower.
75000 gal. on 106' tower.
50000 gal. on 80' tower.
35000 gal. on 90' tower.
25000 gal. on 44' tower.
25000 gal. on 110' tower.

STEEL OIL TANKS:
26—5000, 6500, 8000, 15000, 20000, 25000 & 30,000 gal. cap.
9—10000, 30000 & 55000 BBL.

WOOD TANKS:
7—9'x8' Cypress.
3—16'x24' Cypress.

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450 H.P. W.S.M. Tegner, 2—12 Ft. Reels
150 H.P. Thomas 5 Ft. Single Drum
150 H.P. Vulcan Double Drum
2—100 H.P. Flory 4 Ft. Drum
50 H.P. Ottumwa 3½ Ft. Drum

ELEC. CENTRIFUGAL PUMPS:
400 GPM 100 H.P. 550 Ft. Head
500 GPM 15 H.P. 60 Ft. Head
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750 GPM 15 H.P. 80 Ft. Head
750 GPM 50 H.P. 200 Ft. Head
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650 GPM 40 H.P. 116 Ft. Head
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700 GPM 150 H.P. 556 Ft. Head
800 GPM 150 H.P. 350 Ft. Head
1000 GPM 100 H.P. 220 Ft. Head
2100 GPM 150 H.P. 190 Ft. Head
4600 GPM 150 H.P. 96 Ft. Head

DUMP CARS:
60—12 Ft. Mine Cars
29— 1 Yd. & 1½ Yd. V Shape
19— 3 Yd. V Shape
16— 4 Yd. All Steel Square Body
20—12 Yd. & 8—20 Yd. Air Dump

SHOVELS — DRAGLINES — CRANES:
6 Yd. Bucyrus 200 B Stripper Shovel
4 Yd. Marion Electric Shovel
2 Yd. Marion Electric Shovel
3—52B & 43B Bucyrus Diesel Draglines
3—Monighan Diesel Draglines 3W & 4W
4—¾ & 1 Yd. Bucyrus Elec. Shovels
3—20 & 25 ton Locomotive Cranes
15 and 25 ton Industrial Loco. Cranes

MINE LOADERS — SHOVELS:
9—Conway Models 20, 30, 50, 60 & 75
1¼ yd. P & H Electric Shovel
1 Yd. Lorain Model 57 Elec. Shovel
3—Gardner Denver GD9H
3—Eimco Findley Model 12B & 21
2—Hoar 4 Ft. & 6 Ft. Air Shovels
2—Butler Tunnel Muckers

DIESEL UNITS:
50 H.P. Buda 30 KW 3/60/240 V.
75 H.P. F.M. Model 32E14
100 H.P. Worthington 250 V. D.C.
120 H.P. Muncie 125 V. D.C.
105 KVA Buckeye 3/60/240 V.
125 H.P. Atlas 3/60/240 V.
150 H.P. F.M. Type Y, belt pulley
180 H.P. F.M. Model 35E
200 H.P. Worthington 240 V. D.C.
200 H.P. Atlas 4 cyl. V belt
225 H.P. F.M. 153 KW, 3/60/440 V.
240 H.P. Worthington, 3/60/2300 V.
300 H.P. F.M. Model 32E14

FINE REDUCTION CRUSHERS:
No. 1 Sturtevant Ring Roll Mill
7—Symons 2, 3, 4 & 5 Ft. Cone
11—Kennedy Std. 25, 37, & 49
7 In. & 10 In. Newhouse
10 In. Allis Chalmers McCully
2—Traylor 4½x27 Bulldog
5 In., 6 In., 8 In., 20 In. Traylor
28 In Traylor TY

FINE JAW CRUSHERS:
4x40, 6x20, 8x12, 8x36, 9x16, 9x26, 10x24, 10x30, 10x36, 10x42, 13x30, 15x36, 15x38.

COARSE JAW CRUSHERS:
5x10, 6x12, 6x20, 7x9, 7x10, 10x12, 9x16, 9x18, 10x20, 12x18, 12x20, 12x22, 12x24, 12x26, 14x24, 13x30, 15x30, 15x36, 18x36, 24x36, 30x36, 36x48, 42x48, 56x84, 60x84

BALL MILLS:
5'x22' Tube Mill Flint Lining
6'x6' Herman Ball Mill
3'x36" Hardinge Ball Mill
8'x30" Hardinge Type A Mill
5¼'x20' Smidth Tube Mill
4'x12' Smidth Tube Mill
6'x12' Marcy Rod Mill

CRUSHING ROLLS:
20"x14" Sturtevant Balanced Rolls
42"x18" Traylor AA Rolls
42"x16" Traylor AA Rolls
42"x16" Allis Chalmers B Rolls
40"x20" Cedar Rapids Rolls

AERIAL TRAMWAYS

One continuous aerial tramway, American Steel & Wire Co. 2¼ miles long, 1⅝" Lock Coiled track Cable. Approximately 70 dump buckets 32 cubic feet. Loading Terminal Tail Terminal Approximately 125 ton per hour.

Aerial Tramway Mfg. by Riblet Tramway Co., Approximately 8 miles long with cables. 100 steel Towers Approximately 85 steel bottom buckets, steel loading terminal and steel unloading terminal.

30 TON OHIO LOCOMOTIVE CRANE

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30 TON WHITCOMB GAS LOCOMOTIVE

New York, N. Y.

Liquidation!

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Zone 14

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Alma, Colorado

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1—I.R. J-2 Bit Grinder
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1—2' Symons Short Head Cone Crusher V Belted to 25 H.P. Motor
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1—Atlas, with Batteries & Charger, 24" ga.
2—1" Wilfley Sand Pumps with Motors
2—2" Wilfley Sand Pumps with Motors
1—6'x3' Dorrco Filter, with Vacuum Equipment
3—100 KVA Westinghouse Transformers, 13800-460/230/115
3—New 75 KVA Gen. Elec. Transformers 13,200-2300/4000Y
3—37½ KVA Westinghouse Transformers, 2400-480/240
2—80 H.P. HRT boilers (1 with Iron Fireman Stoker)
15,000'—3 Ph. Lead Covered Sub-Marine Cable, 2300 Volts
26—3 Ton Card Side Dump Cars, 24" ga., R. B.
1—6x4¾x5 G.D. V Type Air Compressor, Mod. WBR-4004
1—16" Belt Conveyor, 80' centers, with gearhead motor
1—3'x18' Dorr Simplex Classifier, Motorized
1—18"x12' Dorr Simplex Classifier, motorized
1—18'x8' Dorr Thickener
1—15'x8' Dorr Thickener

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LOCOMOTIVES
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ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers	Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"	20"	5	1/8"	1/32"
42"	5	1/8"	1/16"	20"	4	1/8"	1/32"
36"	6	1/8"	1/16"	18"	4	1/8"	1/32"
30"	6	1/8"	1/16"	16"	4	1/8"	1/32"
30"	5	1/8"	1/16"	14"	4	1/16"	1/32"
24"	5	1/8"	1/32"	12"	4	1/16"	1/32"
24"	4	1/8"	1/32"				

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

Inquire For Prices - Mention Size and Lengths

ENDLESS "V" BELTS

"A" WIDTH All Sizes | "D" WIDTH All Sizes
"B" WIDTH All Sizes | "E" WIDTH All Sizes
"C" WIDTH All Sizes | Sold in Matched Sets

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FIRE HOSE

APPROVED SPECIFICATION HOSE
EACH LENGTH WITH COUPLINGS ATTACHED

Size	Length	Per Length
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	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

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RUBBER HOSE

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I.D. Size	Each Length with Couplings Attached Length	per Length
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1"	50 "	8.00
	25 "	6.25
1¼"	50 "	12.00
	25 "	7.50
	35 "	10.50
	40 "	12.00
1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

AIR HOSE

I.D. Size	Length	per Length	Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
	50 "	20.00	3.50 "

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All Prices—Net—F.O.B. New York

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1—8'x10' Oliver Drum Filter complete with accessories.

1—7'x48" Hardinge Mill—with motor.

1—6'x16" Hardinge Mill—with motor.

1—5'x18" Allis Chalmers Tube Mill—with motor.

4—30' Dia. x 5' high Steel Thickeners—with mechanism.

500 tons Structural Steel.

1—50,000 gal. Tower Steel Water Tank with 32' Steel Tower—hemisphere bottom.

1—100 tons daily capacity Flotation Plant with Diesel-Electric Power Plant. Location Nevada.

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Complete Mining, Milling and Industrial Plants or any part thereof.

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Compressors—100 C.F.M. to 450 C.F.M.

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1—½ yd. Byers Bearcat crawler type gasoline engine driven shovel.

Pumps—Centrifugal and Reciprocating.

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20—Ton Vulcan Locomotive—Gas—Std. Gauge.

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Battery Charger.

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8—Dump, Western, Automatic, 27-Yd., 40-Ton
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25—Dump, Magor, Automatic, 30-Yd., 50-Ton
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1—pr. 42 x 16 Style B, Allis-Chalmers Crushing Roll weight 36,000 pounds.

2—7½K Gates, Gyratory pressures, weighing 68,100 pounds each with the exception of 1—7½K crusher and the 1 pair of 42 x 16 Style B Crushing Rolls.

1—pr. 42 x 16 roll shells.

2—pr. 41 x 15 roll shells.

Warren Foundry & Pipe Corp.
Harry Davenport, Supt. Wharton, N. J.

FOR SALE

1—240 HP Fairbanks-Morse Diesel elec. set, 480 V., fine condition. $12,500

1—I-R Imperial type 10, 2 stage, 610 cu.ft. air compressor, 100 HP, 440 V, motor complete with receiver. $2,500

1—Double drum hoist, 48" drums, 2000' 1" cable, 150 HP, 440 V, motor complete. $3,550

1—76' Gallows head frame. $750

2—7' Sheeve wheels. $40 each.

1—Hardinge 8 x 36 ball mill, 6' scoop 88' cone. $2,750

1—I-R 310 cu. ft. type 20, gasoline portable compressor. $1,400

1—220 cu. ft. Sullivan gasoline portable compressor. $900

1—Williams No. 4 pipe machine, 2½ to 8" capacity, complete with dies. $1,000

1—Class A Sullivan drill sharpener, complete with dies and dollies. $950

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WANTED

WANTED

One used electric hoist, complete with motor and panels, of approximately the following specifications:

Drums ..... **Double-cylindrical**
Diameter ..... **8'-10'**
Width face ..... **4'-6'**
Rope Speed ..... **800'-1000'**
Maximum Rope Pull . **25000-30000 lbs.**
Maximum Hoisting Depth ..... **2500'**

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Complete Aerial Tramway over 10,000 ft. Broderick & Bascom. 1½, 1⅛, ⅝ steel cable. 72 buckets of 9 cu. ft. Capacity 150 tons per hour. Has operated very short time.

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G.E. Motor Generator Set 2200 volts 75 HP Generator 125 volts D.C. Like new.

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Diamond Drill Sullivan Beauty with hoist. Air driven. Column bar, 200 ft "E" rod.

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3 yard Diesel Dragline 80 to 100' boom
2 yard Diesel shovel
½ yard shovel
Bulldozer
3—10 ton dump trucks

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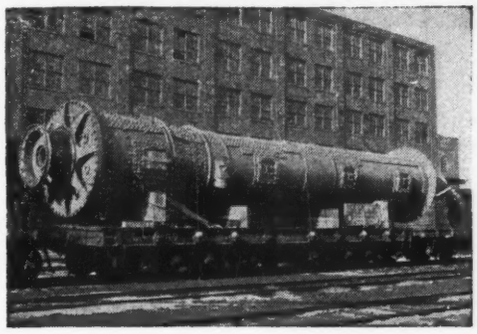

ALLIS-CHALMERS COMPEB MILL

1—#8745 Allis Chalmers Dry Grinding Compeb Mill, 45' long. This is a four compartment mill with the first compartment 10' long and 8' in diameter. The other compartments taper to 7'. The mill has chilled iron liners, and 36" table feeder, 72" Cutler Hammer Magnetic Clutch, and 3 compartment Dust Collector.

New SPARE PARTS available for most items

MILLS

1—Williams mill, size 3.
3—No. 8 Krupp steel ball mills, spur geared, with counter shaft.
1—Allis Chalmers Compeb Mill, complete, gear driven from counter shaft through magnetic clutch, and with induced fan ventilation and dust collectors.
12—30" Griffen Mills.
1—5x20 Smidth steel ball mill.
22—42" Fuller Lehigh pulverizers, each with belt idler.
2—33" Fuller Lehigh pulverizers, each with belt idler.

CRUSHERS

1—Allis Chalmers Fairmont Roll Crusher, 36"x60".
1—No. 6 Gates gyratory rock crusher.
1—No. 6 McCully gyratory rock crusher, style K.
3—No. 5 Gates gyratory crushers.
1—Mosser rotary clinker crusher.
1—No. 10 McCully gyratory rock crusher with extra gear, eccentric and bell.

KILNS

2—Vulcan Iron Works steel rotary kilns, 8'6"x7'6" dia., 125' long, fire brick lined.
1—Vulcan Iron Works steel rotary kiln, 7'x6"x7' dia., 175' long, fire brick lined.
5—W. F. Mosser & Son steel rotary kilns, 5'6"x5' dia., 60' long, fire brick lined.

DRYERS

2—W. F. Mosser & Son steel rotary dryers with 65" steel stack.
2—W. F. Mosser & Son steel rotary dryers, 72"x60" dia., 60' long, bevel gear drive, each with counter shaft and 40' steel stack.
1—W. F. Mosser & Son steel rotary dryer, 72"x60" dia., 55' long, bevel gear drive, with counter shaft and 35' steel stack.
1—W. F. Mosser & Son steel rotary dryer, 72"x60" dia., 55' long, bevel gear drive, with counter shaft and 50' steel stack.
1—Ruggles 5'x30' Rotary Dryer.

CONVEYORS

RUBBER BELT

14" — 16" — 18" — 20" — 24" and 28" Centers varying from 30' to 203' Some with movable Trippers

STEEL SCREW

6" — 7½" — 8" — 10" — 12" — 14" — 16" — 18" and 20" In Steel Box Over 10,000 ft. all lengths.

BUCKET ELEVATORS

Thousands of feet of bucket elevators, all sizes of buckets, mostly all steel encased.
BUCKET SIZES: 10 x 18—10 x 15—9 x 14—9 x 13—9 x 12—8 x 16—8 x 15—8 x 14—8 x 13—8 x 12—7 x 12—7 x 11—7 x 10—6 x 10—6 x 9—6 x 7
With—844; 103; 132 chain from 12' to 60' heights.

NEW BUCKETS and GEARS

HEAT and POWER Company, Inc.
45 BOND STREET ALgonquin 4-3874 NEW YORK 12, N. Y.

Link-Belt K55, 2½ yd. Dragline, 70' boom
Buc. Erie Steam Crane & Shovel, 100' boom
Marion Model 32 Steam Shovel, 1½ yd.
Northwest Model 105 Crane, shop rebuilt
Northwest Model 104 Shovel and Crane
Koehring 301, ¾ yd., gas Shovel and Crane
Buc. Erie Steam Dragline, 6-8 yds. 175' bm.
Buc. Erie 50B Diesel Shovel-Dragline, 2 yds.
Buc. Erie Steam Crane, Model 30B, 40' bm.
Moore Speedcrane 15 ton, gas, 63' bm.
Ind. Brownhoist Crane, gas, 40' bm, 1 yd.
Brownhoist Loco. Crane 35 tons, steam
2—Mack Trucks 6BX. Boulder type, 12 yds.
3—Sterling Trucks 170-C, Boulder type, 12 yds.
3—Allis Chalmers "L" Tractor with bulldozers
Allis Chalmers "L" Tractor with Bulldozer, guaranteed
Allis Chalmers "S" Tractor with Bulldozer
TD40 Diesel Tractor with Bulldozer
Allis Chalmers "30" Tractor with Bulldozer
American 75 ton Locomotive, steam. Rebuilt
American 50 ton Saddle Tank Switcher
Whitcomb 14 ton, 36" gauge, Diesel Loco.
Davenport 10 ton, std. gauge, gas Loco.
Vulcan 8 ton, std. gauge, gas Loco.
Vulcan 6 ton, 36" gauge, gas Locomotive
Steel Storage Bin 200 tons, ¾" plating
Hayward 1 yd. Clam. rehandling Bucket
Blaw-Knox ⅞ yd. Clam. digging Bucket
Hayward ⅞ yd. Clam, digging Bucket
Haiss ¾ yd. Clam, rehandling Bucket
Erie ¾ yd. Clam. rehandling Bucket

RICHARD P. WALSH CO.
30 Church St. New York 7, N. Y.

LOCOMOTIVES

1—American 41 ton, 4 wheel, saddle tank, Locomotive, electric lights, steam brakes, ASME boiler, 190 lbs. Sale or rent.
1—Lima 80 ton, six wheel, Switcher with tender. National Board boiler, 200 lbs. working pressure, super heater, automatic lubrication; excellent condition, immediate delivery.
1—American 68 ton, 6 wheel, Switcher with tender, electric lights, air brakes, power reverse; overhauled.

CRUSHING PLANT

1—Complete Stone Crushing Plant, capacity 850 tons per day. Principle items: 1—Farrel 24x36 Jaw Crusher; 1—Traylor 3', type TY, Reduction Crusher; 1—4x12 triple deck Screen; 1—long 24" Belt Conveyor and 1—short 18" Belt Conveyor; complete with steel bins. Plant can be operated with electric motors, all of which electrical equipment is available; or can be operated with two 100 H.P. Diesel Motors and one 50 KW Diesel motor generator set. Plant all set up in working position; perfect condition throughout; immediate delivery.

CONE CRUSHERS

1—Symons 2 ft. and 5½ ft., coarse bowl.
1—Symons 4 ft., short head, fine bowl.

LOG WASHER

1—Allis Chalmers 25 ft., heavy duty, Hutch type, with steel tank, ⅜" plate, with two logs with paddles 35" diameter.

A. J. O'NEILL
Lansdowne Theatre Bldg., Lansdowne, Pa.
Phila. Phone: Madison 8300

TANKS ON TOWERS

20,000 Gal. Steel Tank, 80 Ft. Tower
25,000 Gal. Steel Tank, 75 Ft. Tower
26,000 Gal. Steel Tank, 42 Ft. Tower
30,000 Gal. Steel Tank, 50 Ft. Tower
30,000 Gal. Steel Tank, 95 Ft. Tower
36,000 Gal. Steel Tank, 50 Ft. Tower
40,000 Gal. Wood Tank, 75 Ft. Tower
40,000 Gal. Steel Tank, 40 Ft. Tower
40,000 Gal. Steel Tank, 25 Ft. Tower
40,000 Gal. Steel Tank, 107 Ft. Tower
50,000 Gal. Steel Tank, 78 Ft. Tower
50,000 Gal. Steel Tank, 75 Ft. Tower
75,000 Gal. Steel Tank, 100 Ft. Tower
60,000 Gal. Steel Tank, 65 Ft. Tower
100,000 Gal. Steel Tank on 75 Ft. Tower

STORAGE — PRESSURE TANKS

Air Receiver 18 in. dia. x 10 ft. long.
2—6,500 gal., horiz. 8 ft. x 17 ft. ¼ in. in Penna.
12,000 gal. horiz. 9 ft. 6 in. x 22 ft. 8 in. ¼ in. Pa.
6—18,000 gal. horiz. 10 ft. x 30 ft. ¼ in., riveted, three located Okla., one Ill., two Indiana
19,500 gal. horiz. 10 ft. x 33 ft. 6 in. riveted, Michigan
20,000 gal. horiz. two compt. 10 ft. 6 in. x 32 ft. ¼", Okla.
8,000 gal. 8 ft. x 22 in. ¼ to 5/16 in. riveted, Pa.
11,500 gal. horiz. 8 ft. x 30 ft. 5/16 in. riveted in Penna.
16,000 gal. horiz. 7/16 in. shell, ¼ in. heads, in D. C.
4—10,000 gal. horiz. pressure tanks, convex heads ⅜ in. in Penna.
18,900 gal. horiz. pressure tank, lead lined 9 ft. x 30 ft. ¾ in. boiler plate, riveted and welded, New York State
4—8 ft. x 20 ft. x ½ in. pressure tanks, N. Y. State
19,500 gal. horiz. 10 ft. x 32 ft. 9 in. ¼ in. in Michigan

R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

Rotary Kilns—8' x 150'—8' x 125'—6' x 100'
Rotary dryers—3' x 30'—4' x 30'—6' x 40'— 8' x 80'—6½' x 50'
Tube & Ball mills—6' x 9'—5' x 22'—5½' x 22'—6' x 22'—5' x 4'.
Fuller-Lehigh mills—42"—47" & 52"—Bradley mills.
Jaw Crushers—From 4" x 6" up to 24" x 36".
Crushing rolls—From 16" x 10" up to 72" x 20".
Hardinge Mills—4½'—7' & 8'.
Sturtevant Rotary fine crushers #0-#1-#1½.
Ring roll mills—Sturtevant #1-#7 Mexicon.
15'—16' & 18' Hereshoff furnaces.
9' x 15' Bruckner roaster—Coppercasting machine.
6' x 4'—8' x 6'—12' x 8' Oliver filters.
8'—14' air separators.
Magnetic separators—jiggs—screens—classifiers & thickeners.
20", 24", & 25 ton Allis-Chalmers lead blast furnaces
One 2 roll and 5 roll Raymond Mills
New Dryers & Kilns built for all purposes

W. P. HEINEKEN
227 Fulton Street New York City

8—Allis Chalmers
Speed-Ace

TRACTOR WAGONS

In excellent condition

Write for illustrated bulletin!!

IRON & STEEL PRODUCTS, INC.
13476 S. Brainard Ave. Chicago 33, Illinois
"Anything containing IRON or STEEL"

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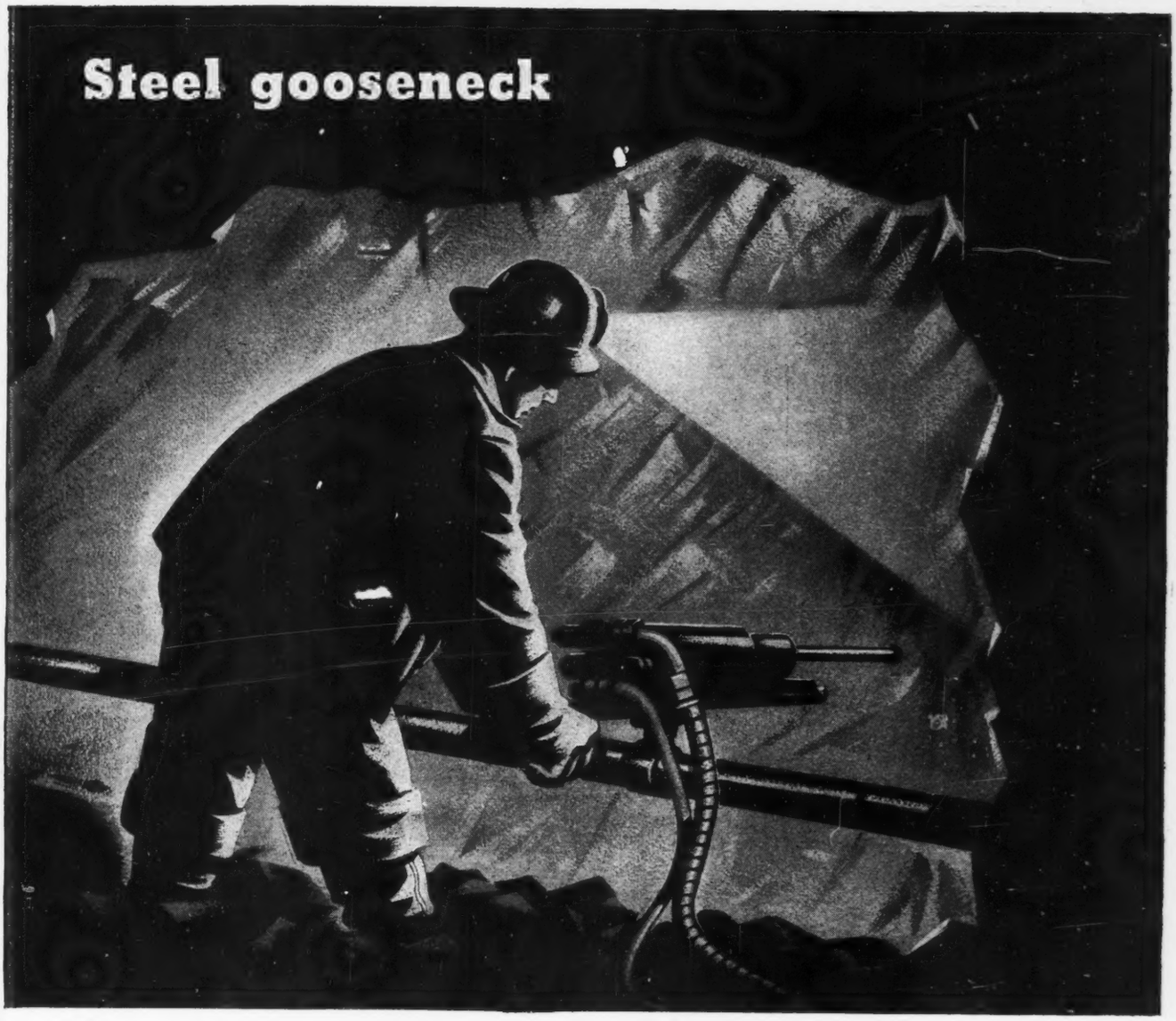
Steel gooseneck



Information supplied by an Industrial Publication

The problem of breakage of the water gooseneck connection to a modern rock drill has been greatly aggravated by the present rubber shortage. When such breakage can assume the proportion of several hundreds of feet of water hose ruined per month, this problem cannot be overlooked.

Due to the constant flexing of the ten or twelve inch length of hose used in the gooseneck, it tends to fail prematurely under the high water pressure. Failure during operation may easily mean the loss of several man-hours of production.

This problem has been completely solved by a large Western mining company by the elimination of such hose and the use of a metal gooseneck in its stead. The device is turned from seamless steel tubing and formed into a long sweep bend to facilitate the clearance of throttle and air hose connections.

In this case the substitute has proven more successful than the conventional hose.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company

500 Fifth Avenue • New York City

MOLY

In war or peace
B.F.Goodrich
FIRST IN RUBBER

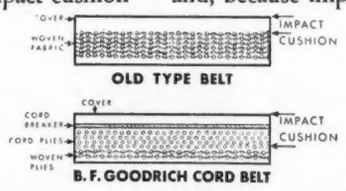
B. F. Goodrich cord belt carried twice the tonnage of any previous belt

Record shows two-million-ton load under worst conditions

THIS was the situation: A 50-50 mixture of sand and rock; intermittent loading; a 10-foot drop from crusher to belt; belt loaded at an angle; crusher jaws designed to pass lumps 10 inches thick but actually passing 12-inch slabs several times a day; some lumps weighing more than 500 pounds. No wonder 1,000,000 tons of material carried was the best that ordinary belts ever did.

But that's the very type of service the B. F. Goodrich cord belt was designed for. And the one installed on this job carried *2,134,721 tons of rock* before it wore out.

The diagram shows why B. F. Goodrich cord belts out-perform ordinary belts by such a great degree. Note the cord plies made up of individual cords encased in rubber. In effect they double the thickness of the impact cushion — and, because impact



OLD TYPE BELT

B. F. GOODRICH CORD BELT

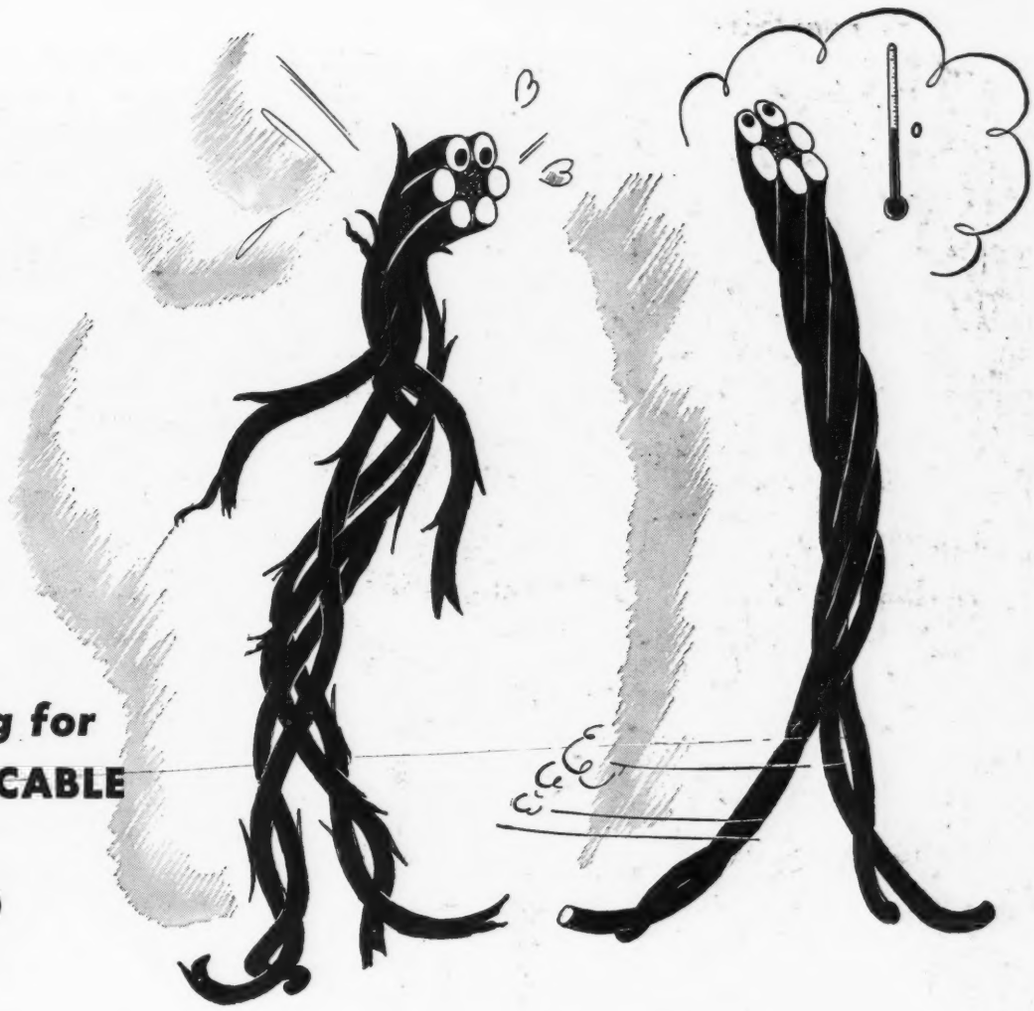
resistance varies as the *square* of the cushion thickness, resistance is increased *from 4 to 6 times.*

Note the cord breaker running *across* the belt. That permits a spreading action that resists the cutting and gouging of heavy lumps striking the belt at the loading point. Belt life is greatly increased; ply separation practically eliminated.

B. F. Goodrich cord belts, now being made of synthetic rubber, can be used for all kinds of conveyor jobs and are especially important for the really hard jobs that quickly ruin ordinary belts. If you have such a job in your conveyor system, ask the nearest B. F. Goodrich representative for complete information. Or write, *The B. F. Goodrich Co., Industrial Products Division, Akron, O.*

B.F. Goodrich

RUBBER *and* SYNTHETIC *products*



Keep asking for AMERICAN CABLE TRU•LAY PREFORMED WIRE ROPE

Because... it refuses to porcupine!

When the outer wires of **TRU-LAY PREFORMED** finally break after long use, they do not "porcupine" and stick out from the rope as do the broken crown wires of non-preformed rope. They do not become dangerous, chisel-sharp jaggers that will tear men's hands even through stoutest gloves. Naturally this advantage enables men to work better with **TRU-LAY PREFORMED.** They handle it with speed and confidence. They know **TRU-LAY** is a much safer rope to handle.

TRU-LAY PREFORMED's refusal to porcupine affords protection for its own sake, as well as for sheaves, drums, and other equipment which can be injured by protruding wires. Thus, this single feature (one out of many) protects your workmen against dangerous, time-out accidents—extends the service life of your wire rope—reduces needless wear to your equipment.

No wonder the Armed Forces took so much of our production!

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Portland, Tacoma

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT, CONNECTICUT

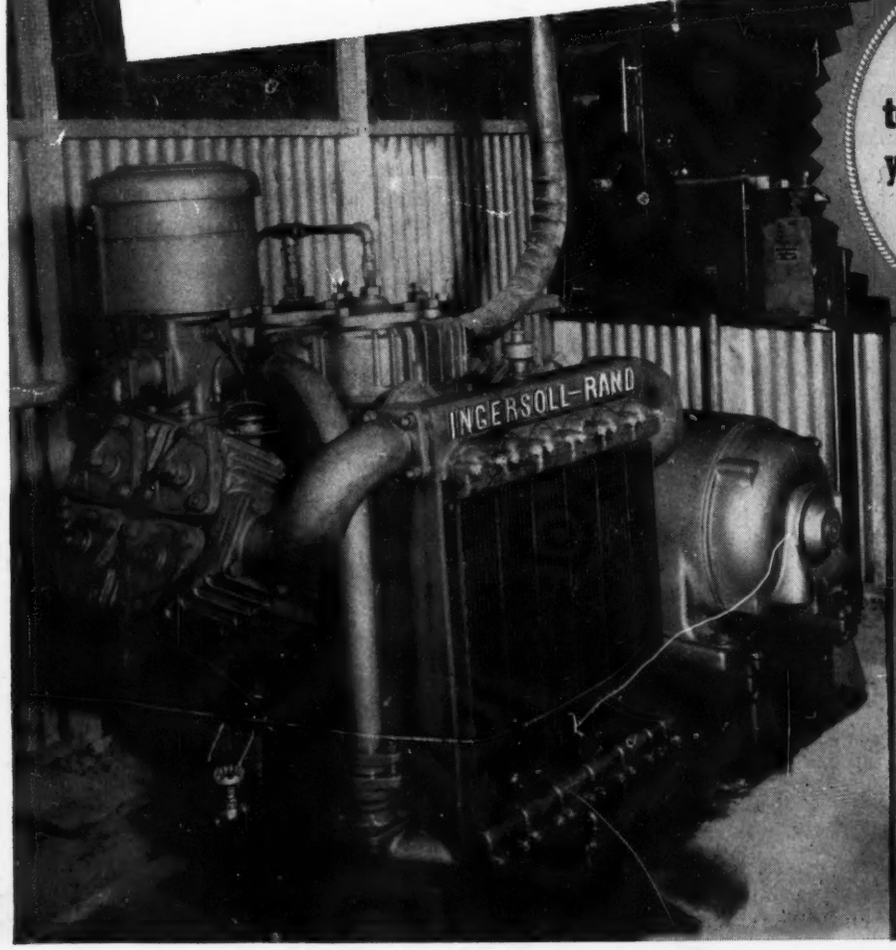
ESSENTIAL PRODUCTS... TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses... *In Business for Your Safety*

TIMKEN BEARING EQUIPPED COMPRESSOR
Supplies Air For Strategic Metal Mine

This Ingersoll-Rand 50 B Motor Compressor is installed at the property of a well-known quicksilver company to supply air for various mine operations. The compressor crank shaft is mounted on Timken Tapered Roller Bearings for smooth operation; protection against radial, thrust and combined loads; maximum endurance; and low maintenance.

Thousands of Ingersoll-Rand Compressors equipped with Timken Bearings are in service in mines; factories; construction work and other kinds of service. And wherever they are used they are giving dependable, top-notch performance.

If you are thinking of buying an anti-frictionized compressor make sure it is equipped with Timken Bearings; then you will be sure of getting anti-friction advantages in full. The Timken Roller Bearing Company, Canton, Ohio.



Beat post-war competition to the punch; redesign your products to use more Timken Bearings.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS